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

Kindergarten

Common Core Critical Areas	Common Core Core Standards[i]	Michigan Focal Point	Michigan GLCE Topics and Expectations
Representing, comparing and ordering whole numbers and joining and separating sets	**Number—Counting and Cardinality[ii] K-NCC** **Number names[iii]** 1. Say the number name sequence to 100. 2. Know the decade words to ninety and recite them in order ("ten, twenty, thirty, …"). 3. Say the number name sequence forward or backward beginning from a given number within the known sequence (instead of always beginning at 1). 4. Write numbers from 1 to 20 in base-ten notation. **Counting to tell the number of objects** 5. Count to answer "how many?" questions about as many as 20 things. Objects may be arranged in a line, a rectangular array, a circle, or a scattered configuration. 6. Understand that when counting objects, a. The number names are said in the standard order. b. Each object is paired with one and only one number name. c. The last number name said tells the number of objects counted. 7. Understand that when counting forward, each successive number name refers to a quantity that is 1 larger. **Comparing and ordering numbers** 8. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group. 9. Compare and put in order numbers between 1 and 10 presented in written symbols. **Number—Operations and the Problems They Solve K-NOP** **Composing and decomposing numbers; addition and subtraction** 1. Understand addition as putting together—e.g., finding the number of objects in a group formed by putting two groups together. Understand subtraction as taking apart—e.g., finding the number of objects left when a one group is taken from another. 2. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. 3. Decompose numbers less than or equal to 10 into pairs in various ways, e.g., using objects or drawings, and record	**Representing, comparing, and ordering whole numbers and joining and separating sets**	**Count, write, and order numbers** 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. N.ME.00.04 Read and write numbers to 30 and connect them to the quantities they represent. N.ME.00.01 Count objects in sets up to 30. 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. N.ME.00.03 Compare and order numbers to 30 using phrases such as "more than" or "less than." **Compose and decompose numbers** 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. N.MR.00.07 Compose and decompose numbers from 2 to 10, e.g., 5 = 4 + 1 = 2 + 3, with attention to the additive structure of number systems, e.g., 6 is one more than 5, 7 is one more than 6. 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.

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	each decomposition by a drawing or equation (e.g., 5 = 2 + 3). Compose numbers whose sum is less than or equal to 10, e.g., using objects or drawings, and record each composition by a drawing or equation (e.g., 3 + 1 = 4). 4. Compose and decompose numbers less than or equal to 10 in two different ways, and record compositions and decompositions by drawings or equations. 5. Understand that addition and subtraction are related. 6. Solve addition and subtraction word problems, and calculate additions and subtractions within 10. 7. Fluently add and subtract, for sums and minuends of 5 or less. **Number—Base Ten K-NBT** **Two-digit numbers** 1. Understand that 10 can be thought of as a bundle of ones—a unit called a "ten." 2. Understand that a teen number is composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. 3. Compose and decompose teen numbers into a ten and some ones, e.g., by using objects or drawings, and record the compositions and decompositions in base-ten notation. 4. Put in order numbers presented in base-ten notation from 1 to 20 (inclusive), and be able to explain the reasoning. 5. Understand that a decade word refers to one, two, three, four, five, six, seven, eight, or nine tens. 6. Understand that the two digits of a two-digit number represent amounts of tens and ones. **Composing and decomposing ten** 7. Decompose 10 into pairs of numbers, e.g., by using objects or drawings, and record each decomposition with a drawing or equation. 8. Compose numbers to make 10, e.g., by using objects or drawings, and record each composition with a drawing or equation. 9. 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.		**Add and subtract numbers** N.MR.00.09 Record mathematical thinking by writing simple addition and subtraction sentences. **Explore number patterns** N.MR.00.10 Create, describe, and extend simple number patterns.
	Measurement and Data K-MD **Direct measurement** 1. Understand that objects have measurable attributes, such as length or weight. A single object might have several measurable attributes of interest. 2. Directly compare two objects with a measurable attribute in common, to see which object has "more of" the	**Ordering objects by measurable attributes**	**Explore other measurement attributes** M.UN.00.04 Compare two or more objects by length, weight and capacity. M.PS.00.05 Compare length and weight of objects by comparing to reference objects, and use terms such as shorter, longer, taller, lighter, heavier.

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	attribute. **Representing and interpreting data** 3. Classify objects or people into given categories; count the numbers in each category and sort the categories by count.		**Explore concepts of time** M.UN.00.01 Know and use the common words for the parts of the day (morning, afternoon, evening, night) and relative time (yesterday, today, tomorrow, last week, next year). 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	**Geometry K-G** **Shapes, their attributes, and spatial reasoning** 1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to. 2. Understand that names of shapes apply regardless of the orientation or overall size of the shape. For example, a square in any orientation is still a square. Students may initially need to physically rotate a shape until it is "level" before they can correctly name it. 3. Understand that shapes can be two-dimensional (lying in a plane, "flat") or three-dimensional ("solid"). 4. Understand that shapes can be seen as having parts, such as sides and vertices ("corners"), and that shapes can be put together to compose other shapes. 5. Analyze and compare a variety of two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, component parts (e.g., number of sides and vertices) and other attributes (e.g., having sides of equal length). 6. Combine two- or three-dimensional shapes to solve problems such as deciding which puzzle piece will fit into a place in a puzzle.	**Describing shapes and space**	**Create, explore, and describe shapes** G.GS.00.01 Relate familiar three-dimensional objects inside and outside the classroom to their geometric name, G.GS.00.02 Identify, sort, and classify objects by attribute and identify objects that do not belong in a particular group. **Explore geometric patterns** G.GS.00.03 Create, describe, and extend simple geometric patterns.

1st Grade

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Developing understanding of addition, subtraction, and strategies for additions and subtractions within 20	**Number—Operations and the Problems They Solve 1-NOP** **Addition and subtraction** 1. Understand the properties of addition. a. Addition is commutative. b. Addition is associative. c. 0 is the additive identity. 2. Explain and justify properties of addition and subtraction, e.g., by using representations such as objects, drawings, and story contexts. Explain what happens when: a. The order of addends in a sum is changed in a sum with two addends. b. 0 is added to a number. c. A number is subtracted from itself. d. One addend in a sum is increased by 1 and the other addend is decreased by 1. *Limit to two addends.* 3. Understand that addition and subtraction have an inverse relationship. 4. Understand that when all but one of three numbers in an addition or subtraction equation are known, the unknown number can be found. *Limit to cases where the unknown number is a whole number.* 5. Understand that addition can be recorded by an expression (e.g., 6 + 3), or by an equation that shows the sum (e.g., 6+ 3 = 9). Likewise, subtraction can be recorded by an expression (e.g., 9 – 5), or by an equation that shows the difference (e.g., 9 – 5 = 4). **Describing situations and solving problems with addition and subtraction** 6. Understand that addition and subtraction apply to situations of adding-to, taking-from, putting together, taking apart, and comparing. 7. Solve word problems involving addition and subtraction within 20, e.g., by using objects, drawings and equations to represent the problem. 8. Solve word problems involving addition of three whole numbers whose sum is less than or equal to 20.	**Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts**	**Add and subtract whole numbers** N.ME.01.08 List number facts (partners inside of numbers) for 2 through 10. N.MR.01.09 Compare two or more sets in terms of the difference in number of elements. 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.01.11 Understand the inverse relationship between addition and subtraction. N.FL.01.12 Know all the addition facts up to 10 + 10, 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.01.14 Add three one-digit numbers. N.FL.01.15 Calculate mentally sums and differences involving: a two-digit number and a one-digit number without regrouping; a two-digit number and a multiple of 10. N.FL.01.16 Compute sums and differences through 30 using number facts and strategies, but no formal algorithm. **Work with money** M.PS.01.07 Add and subtract money in dollars only or in cents only. **Solve problems** 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.
Developing understanding of whole number relationships, including grouping in tens and ones	**Number—Base Ten 1-NBT** **Numbers up to 100** 1. Read and write numbers to 100. 2. Starting at any number, count to 100 or beyond. 3. Understand that when comparing two-digit numbers, if one number has more tens, it is greater; if the amount of tens is the same in each number, then the number with more ones is greater.	**Developing an understanding of whole number relationships, including grouping in tens and ones**	**Count, write, and order numbers** 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. N.ME.01.03 Order numbers to 110; compare using phrases

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	4. Compare and order two-digit numbers based on meanings of the tens and ones digits, using > and < symbols to record the results of comparisons. **Adding and subtracting in base ten** 5. Calculate mentally, additions and subtractions within 20. a. Use strategies that include counting on; making ten; and decomposing a number. 6. Demonstrate fluency in addition and subtraction within 10. 7. Understand that in adding or subtracting two-digit numbers, one adds or subtracts like units (tens and tens, ones and ones) and sometimes it is necessary to compose or decompose a higher value unit. 8. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count. 9. Add one-digit numbers to two-digit numbers, and add multiples of 10 to one-digit and two-digit numbers. 10. Explain addition of two-digit numbers using concrete models or drawings to show composition of a ten or a hundred. 11. Add two-digit numbers to two-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used.		such as "same as", "more than", "greater than", "fewer than"; use = symbol. Arrange small sets of numbers in increasing or decreasing order. N.ME.01.04 Identify one more than, one less than, 10 more than, and 10 less than for any number up to 100. 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. **Explore place value** N.ME.01.07 Compose and decompose numbers through 30, including using bundles of tens and units
Developing understanding of linear measurement and measuring lengths	**Measurement and Data 1-MD** **Length measurement** 1. Order three objects by length; compare the length of two objects indirectly by using a third object. 2. Understand that the length of an object can be expressed numerically by using another object as a length unit (such as a paper-clip, yardstick, or inch length on a ruler). The object to be measured is partitioned into as many equal parts as possible with the same length as the length unit. The length measurement of the object is the number of length units that span it with no gaps or overlaps. 3. Measure the length of an object by using another object as a length unit. **Time measurement** 4. Tell time from analog clocks in hours and half- or quarter-hours. **Representing and interpreting data** 5. Organize, represent, and interpret data with several 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.	**Developing understanding of linear measurement and measuring lengths**	**Estimate and measure length** M.UN.01.01 Measure the lengths of objects in non-standard units, e.g., pencil lengths, shoe lengths, to the nearest whole unit. M.UN.01.02 Compare measured lengths using the words shorter, shortest, longer, longest, taller, tallest, etc. **Tell time** M.UN.01.03 Tell time on a twelve-hour clock face to the hour and half-hour. **Use pictographs** 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.

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Composing and decomposing geometric shapes	**Geometry 1-G** **Shapes, their attributes, and spatial reasoning** 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. 2. Understand that shapes can be joined together (composed) to form a larger shape or taken apart (decomposed) into a collection of smaller shapes. Composing multiple copies of some shapes creates tilings. 3. Compose two-dimensional shapes to create a unit, using cutouts of rectangles, squares, triangles, half-circles, and quarter-circles. Form new shapes by repeating the unit. 4. Compose three-dimensional shapes to create a unit, using concrete models of cubes, right rectangular prisms, right circular cones, and right circular cylinders. Form new shapes by repeating the unit. 5. Decompose circles and rectangles into two and four equal parts. Describe the parts using the words *halves*, *fourths*, and *quarters*, and using the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as *two of, or four* of the parts. Understand that decomposing into more equal shares creates smaller shares. 6. Decompose two-dimensional shapes into rectangles, squares, triangles, half-circles, and quarter-circles, including decompositions into equal shares. **No match to Common Core**		**Create and describe shapes** G.GS.01.01 Create common two-dimensional and three-dimensional shapes, and describe their physical and geometric attributes, such as color and shape. G.LO.01.02 Describe relative position of objects on a plane and in space, using words such as *above, below, behind, in front of.* **Create and Describe Patterns Involving Geometric Objects** G.SR.01.03 Create and describe patterns, such as 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

Common Core Critical Areas	Common Core Core Standards: Students Can and Do	Michigan Focal Point	Michigan GLCE Topics Expectations
Developing understanding of base-ten notation	**Number—Base Ten 2-NBT** **Numbers up to 1000** 1. Understand that 100 can be thought of as a bundle of tens—a unit called a "hundred." 2. Read and write numbers to 1000 using base-ten notation, number names, and expanded form. 3. Count within 1000; skip count by 2s, 5s, 10s, and 100s. 4. Understand that when comparing three-digit numbers, if one number has more hundreds, it is greater; if the amount of hundreds is the same in each number, then the number with more tens is greater. If the amount of tens and hundreds is the same in each number, then the number with more ones is greater. 5. Compare and order three-digit numbers based on meanings of the hundreds, tens, and ones digits.	**Developing an understanding of the base-ten numeration system and place-value concepts**	**Count, write, and order whole numbers** 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.02.03 Compare and order numbers to 1000; use the symbols > and <. 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. **Understand place value** 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.
Developing fluency with additions and subtractions within 20 and fluency with multi-digit addition and subtraction	**Number—Base Ten 2-NBT** **Adding and subtracting in base ten** 6. Fluently add and subtract within 20. By end of Grade 2, know from memory sums of one-digit numbers. 7. Mentally compute sums and differences of multiples of 10. *For example, mentally calculate 130 – 80.* 8. Understand that in adding or subtracting three-digit numbers, one adds or subtracts like units (hundreds and hundreds, tens and tens, ones and ones) and sometimes it is necessary to compose or decompose a higher value unit. 9. Given a number from 100 to 900, mentally find 10 more or 10 less than the number, and mentally find 100 more or 100 less than the number, without counting. 10. Understand that algorithms are predefined steps that give the correct result in every case, while strategies are purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. 11. Compute sums and differences of one-, two-, and three-digit numbers using strategies based on place value, properties of operations, and/or the inverse relationship between addition and subtraction; explain the reasoning used. 12. Explain why addition and subtraction strategies and algorithms work, using place value and the properties of operations. 13. Compute sums of two three-digit numbers, and compute	**Developing quick recall of addition facts and related subtraction facts and fluency with multi-digit addition and subtraction**	**Add and subtract whole numbers** N.FL.02.06 Decompose 100 into addition pairs, e.g., 99 + 1, 98 + 2. N.MR.02.07 Find the distance between numbers on the number line. N.MR.02.08 Find missing values in open sentences, e.g., 42 + ■ = 57; 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.02.10 Add fluently two numbers through 99, using strategies including formal algorithms; subtract fluently two numbers through 99. N.FL.02.11 Estimate the sum of two numbers with three digits. 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.

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	sums of three or four two-digit numbers, using the standard algorithm; compute differences of two three-digit numbers using the standard algorithm. **Number—Operations and the Problems They Solve 2-NOP** **Addition and subtraction** 1. Explain and justify properties of addition and subtraction, e.g., by using representations such as objects, drawings, and story contexts. Include properties such as: a. Changing the order of addends does not change their sum. b. Subtracting one addend from a sum of two numbers results in the other addend. c. If more is subtracted from a number, the difference is decreased, and if less is subtracted the difference is increased. d. In an addition equation, each addend can be decomposed and the parts can be recombined in any order without changing the sum. **Describing situations and solving problems with addition and subtraction** 2. Solve word problems involving addition and subtraction within 100, e.g., by using drawings or equations to represent the problem. 3. Solve two-step word problems involving addition and subtraction within 100, e.g., by using drawings or equations to represent the problem.		
	Measurement and Data 2-MD **Length measurement** 1. Understand that 1 inch, 1 foot, 1 centimeter, and 1 meter are conventionally defined lengths used as standard units. 2. Measure lengths using measurement tools such as rulers, yardsticks and measuring tapes; understand that these tools are used to find out how many standard length units span an object with no gaps or overlaps, when the 0 mark of the tool is aligned with an end of the object. 3. Understand that when measuring a length, if a smaller unit is used, more copies of that unit are needed to measure the length than would be necessary if a larger unit were used. 4. Understand that units can be decomposed into smaller units, e.g., 1 foot can be decomposed into 12 inches and 1 meter can be decomposed into 100 centimeters. A small number of long units might compose a greater length than a large number of small units.		**Measure, add, and subtract length** M.UN.02.01 Measure lengths in meters, centimeters, inches, feet, and yards approximating to the nearest whole unit and using abbreviations. M.PS.02.02 Compare lengths; add and subtract lengths (no conversion of units). **Solve measurement problems** M.TE.02.11 Determine perimeters of rectangles and triangles by adding lengths of sides, recognizing the meaning of perimeter. M.PS.02.10 Solve simple word problems involving length and money.

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	5. Understand that lengths can be compared by placing objects side by side, with one end lined up. The difference in lengths is how far the longer extends beyond the end of the shorter. 6. Understand that a sum of two whole numbers can represent a combination of two lengths; a difference of two whole numbers can represent a difference in length; find total lengths and differences in lengths using addition and subtraction. **Time and money** 7. Find time intervals between hours in one day. 8. Solve word problems involving dollar bills, quarters, dimes, nickels and pennies. *Do not include dollars and cents in the same problem.* **Representing and interpreting data** 9. Generate measurement data by measuring whole-unit lengths of several objects, or by making repeated measurements of the same object. Show the measurements by making a dot plot, where the horizontal scale is marked off in whole number units. 10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with several categories. Connect representations on bar graph scales, rulers, and number lines that begin with zero. Solve simple Put Together/Take Apart and Compare problems using information presented in a bar graph.		**Tell time and solve time problems** 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. 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. **Record, add and subtract money** M.UN.02.07 Read and write amounts of money using .decimal notations, M.PS.02.08 Add and subtract money in mixed units. **Create, interpret, and solve problems involving pictographs** D.RE.02.01 Make pictographs using a scale representation, using scales where symbols equal more than one. D.RE.02.02 Read and interpret pictographs with scales, using scale factors of 2 and 3. D.RE.02.03 Solve problems using information in pictographs; include scales such as each ☐ represents 2 apples; avoid ☐ cases.
Describing and analyzing shapes	Geometry 2-G **Shapes, their attributes, and spatial reasoning** 1. Understand that different categories of shapes (e.g., rhombuses, trapezoids, rectangles, and others) can be united into a larger category (e.g., quadrilaterals) on the basis of shared attributes (e.g., having four straight sides). 2. Identify and name polygons of up to six sides by the number of their sides or angles. 3. Recognize rectangles, rhombuses, squares and trapezoids as examples of quadrilaterals; draw examples of quadrilaterals that do not belong to any of these subcategories. 4. Draw and identify shapes that have specific attributes, such as number of equal sides or number of equal angles.	**Composing and decomposing geometric shapes**	**Identify and describe shapes** G.GS.02.01 Identify, describe, and compare familiar two-dimensional and three-dimensional shapes. G.GS.02.02 Explore and predict the results of putting together and taking apart two-dimensional and three-dimensional shapes. G.GS.02.04 Distinguish between curves and straight lines and between curved surfaces and flat surfaces. G.SR.02.05 Classify familiar plane and solid object by common attributes such as shape, size, color, roundness, or number of corners and explain which attributes are being used for classification. G.TR.02.06 Recognize that shapes that have been slid, turned, or flipped are the same shape.

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	Sizes of lengths and angles are compared directly or visually, not compared by measuring. 5. Recognize objects as resembling spheres, right circular cylinders, and right rectangular prisms. 6. Decompose circular and rectangular objects into two, three, or four equal parts. Describe the parts using the words *halves*, *thirds*, *half of*, *a third of*, etc.; describe the wholes as *two halves, three thirds, four fourths*. Recognize that a half, a third, or a fourth of a circular or rectangular object—a graham cracker, for example—is the same size regardless of its shape.		**Work with unit fractions** N.ME.02.18 Recognize, name, and represent commonly used unit fractions with denominators 12 or less; model by folding strips. N.ME.02.19 Recognize, name, and write commonly used fractions. N.ME.02.20 Place 0 and halves, e.g., ½, 1 ½, 2 ½ 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. N.ME.02.22 Recognize that fractions such as 2/2 , 3/3, and 4/4 are equal to the whole (one).
	(See 3rd Grade Common Core)	**Connections**	**Understand meaning of multiplication and division** N.MR.02.13 Understand multiplication as the result of counting the total number of objects in a set of equal groups, e.g., 3 x 5 gives the number of objects in 3 groups of 5 objects, or 3 x 5 = 5 + 5 + 5 = 15. N.MR.02.14 Represent multiplication using area and array models. N.MR.02.15 Understand division (÷) as another way of expressing multiplication, using fact families within the 5 x 5 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 5 x 5. **Understand the Concept of Area** M.UN.02.03 Measure area using non-standard units to the nearest whole unit. 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.
	No match to Common Core	**Connections**	**Read Thermometers** M.UN.02.09 Read temperature using the scale on a thermometer in degrees Fahrenheit. **Use coordinate systems** G.LO.02.07 Find and name locations using simple coordinate systems such as maps and first quadrant grids.

Third Grade

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	Number—Base Ten 3-NBT **Numbers up to 10,000** 1. Understand that 1000 can be thought of as a bundle of hundreds—a unit called a "thousand." 2. Read and write numbers to 10,000 using base-ten notation, number names, and expanded form. 3. Count within 10,000; skip count by 10s, 100s and 1000s. 4. Understand that when comparing four-digit numbers, if one number has more thousands, it is greater; if the amount of thousands is the same in each number, then the number with more hundreds is greater; and so on. Compare and order four-digit numbers based on meanings of the digits. **Adding and subtracting in base ten** 5. Mentally calculate sums and differences of multiples of 10, 100, and 1000. 6. Given a number from 1000 to 9000, mentally find 100 more or 100 less than the number, and mentally find 1000 more or 1000 less than the number, without counting. **Multiplying and dividing in base ten** 7. Understand that the distributive property is at the heart of strategies and algorithms for multiplication and division computations with numbers in base-ten notation; use the distributive property and other properties of operations to explain patterns in the multiplication table and to derive new multiplication and division equations from known ones. 8. Fluently multiply one-digit numbers by 10. 9. Use a variety of strategies for multiplication and division within 100. By end of Grade 3, know from memory products of one-digit numbers where one of the factors is 2, 3, 4, or 5. **(See 2nd Grade Common Core)**	**Connections**	**Understand and use number notation and place value** 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 2000+ 500+10+ 7; 4 hundreds and 2 ones is 402.* N.ME.03.03 Compare and order numbers up to 10,000. **[See also 4th grade GLCE]** **Add and subtract whole numbers** N.FL.03.06 Add and subtract fluently two numbers through 999 with regrouping and through 9,999 without regrouping. 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. N.FL.03.08 Use mental strategies to fluently add and subtract two-digit numbers.
	Number—Operations and the Problems They Solve 3-NOP **Multiplication and division** 1. Understand that multiplication of whole numbers is	**Developing understandings of multiplication and division and**	**Multiply and divide whole numbers** N.MR.03.09 Use multiplication and division fact families to

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	repeated addition. *Products can be represented by rectangular arrays, with one factor the number of rows and the other the number of columns.* 2. Understand the properties of multiplication. a. Multiplication is commutative. b. Multiplication is associative. c. 1 is the multiplicative identity. d. Multiplication distributes over addition (the distributive property). 3. Explain and justify properties of multiplication and division, e.g., by using representations such as objects, drawings, and story contexts. Include properties such as: a. Changing the order of two factors does not change their product. b. The product of a number and 1 is the number. c. Dividing a nonzero number by itself yields 1. d. Multiplying a quantity by a nonzero number, then dividing by the same number, yields the original quantity. e. When one factor in a product is multiplied by a number and another factor divided by the same number, the product is unchanged. f. Products where one factor is a one-digit number can be computed by decomposing one factor as the sum of two numbers, multiplying each number by the other factor, and adding the two products. 4. Understand that multiplication and division have an inverse relationship. 5. Understand that when all but one of three numbers in a multiplication or division equation are known, the unknown number can be found. **Describing situations and solving problems with multiplication and division** 6. Understand that multiplication and division apply to situations with equal groups, arrays or area, and comparing. 7. Solve word problems involving multiplication and division within 100, using an equation with a symbol for the unknown to represent the problem. 8. Solve one- or two-step word problems involving the four operations. 9. Understand that multiplication and division can be used to compare quantities; solve multiplicative comparison problems with whole numbers (problems involving the notion of "times as much").	**strategies for basic multiplication facts and related division facts**	understand the inverse relationship of these two operations, e.g., because 3 x 8 = 24, we know that 24 ÷ 8 = 3 or 24 ÷ 3 = 8; express a multiplication statement as an equivalent division statement. 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.FL.03.11 Find products fluently up to 10 x 10; find related quotients using multiplication and division relationships. N.MR.03.12 Find solutions to open sentences, such as 7 x ☐ = 42 or 12 ÷ ☐ = 4, using the inverse relationship between multiplication and division. 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, 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. **Problem solving with whole numbers** 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. **Count in steps, and understand even and odd numbers** 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. 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.

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	Number—Fractions 3-NF **Fractions as representations of numbers** 1. Understand that a unit fraction corresponds to a point on a number line. 2. Understand that fractions are built from unit fractions. 3. Understand that two fractions are equivalent (represent the same number) when both fractions correspond to the same point on a number line. Recognize and generate equivalent fractions with denominators 2, 3, 4, and 6 (e.g., 1/2 = 2/4, 4/6 = 2/3), and explain the reasoning. 4. Understand that whole numbers can be expressed as fractions. **Fractional quantities** 5. Understand that fractions apply to situations where a whole is decomposed into equal parts; use fractions to describe parts of wholes. 6. Compare and order fractional quantities with equal numerators or equal denominators, using the fractions themselves, tape diagrams, number line representations, and area models. Use > and < symbols to record the results of comparisons. **(See 4th Grade Common Core)**	**Developing an understanding of fractions and fraction equivalence**	**Understand simple fractions, relation to the whole, and addition and subtraction of fractions** 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. 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. 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. **Understand simple decimal fractions in relation to money** N.ME.03.21 Understand the meaning of $0.50 and $0.25 related to money.
Common Core Standards Critical Areas	**Measurement and Data 3-MD** **The number line and units of measure** 1. Understand that a number line has an origin (0) and a unit (1), with whole numbers one unit distance apart. Use number lines to represent problems involving distances, elapsed time, amounts of money and other quantities. 2. Understand that a unit of measure can be decomposed into equal-sized parts, whose sizes can be represented as fractions of the unit. Convert measurements in one unit to measurements in a smaller or a larger unit, and solve problems involving such mixed units (e.g., feet and inches, weeks and days). **Perimeter and area** 3. Understand and use concepts of area measurement. a. A square with side length 1 unit, called "a unit square,"		**Measure and use units for length, weight, temperature and time** M.UN.03.01 Know and use common units of measurements in length, weight and time. 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. **Solve measurement problems:** M.PS.03.12 Solve applied problems involving money, length, and time. **Understand meaning of area and perimeter and apply**

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	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 overlaps by *n* unit squares has an area of *n* square units. Areas of some other figures can be measured by using fractions of unit squares or using figures whose areas have been found by decomposing other figures. c. When measuring an area, if a smaller unit of measurement is used, more units must be iterated to measure the area in those units. d. Determine and compare areas by counting square units. *Use cm2, m2, in2, ft2, and improvised units.* 4. Understand that multiplication of whole numbers can be represented by area models; a rectangular region that is *a* length units by *b* length units (where *a* and *b* are whole numbers) and tiled with unit squares illustrates why the rectangle encloses an area of $a \times b$ square units. 5. Solve problems involving perimeters of polygons. a. Add given side lengths, and multiply for the case of equal side lengths. b. Find an unknown length of a side in a polygon given the perimeter and all other side lengths; represent these problems with equations involving a letter for the unknown quantity. c. Exhibit rectangles with the same perimeter and different area, and with the same area and different perimeter. **Representing and interpreting data** 6. 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. *Include single unit scales and multiple-unit scales; for example, each square in the bar graph might represent 1 pet, 5 pets, or 10 pets.* 7. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a dot plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	**Developing an understanding of area and perimeter and determining the areas and perimeters of two-dimensional shapes**	**in problems:** 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, and choose a unit appropriate in the context. M.UN.03.08 Visualize and describe the relative sizes of one square inch and one square centimeter. **Estimate perimeter and area:** 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. **Solve measurement problems:** M.PS.03.12 Solve applied problems involving money, length, and time. M.PS.03.13 Solve contextual problems about perimeters of rectangles and areas of rectangular regions. **Use bar graphs** 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.
Common Core Standards Critical Areas	**(See also 4th Grade Common Core)**	**Describing properties of two-dimensional shapes and classifying**	**Recognize the basic elements of geometric objects** G.GS.03.01 Identify points, line segments, lines, and distance. G.GS.03.02 Identify perpendicular lines and parallel lines in familiar shapes and in the classroom.

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	Properties of two-dimensional shapes 1. Understand that a given category of plane figures (e.g., triangles) has subcategories (e.g., isosceles triangles) defined by special properties. 2. Describe, analyze, compare and classify two-dimensional shapes by their properties and connect these properties to the classification of shapes into categories and subcategories (e.g., squares are "special rectangles" as well as "special rhombuses"). **Structuring rectangular shapes** 3. Understand that rectangular regions can be tiled with squares in rows and columns, or decomposed into such arrays. 4. Structure a rectangular region spatially by decomposing it into rows and columns of squares. Determine the number of squares in the region using that spatial structure (e.g., by multiplication or skip counting). 5. Understand that shapes can be decomposed into parts with equal areas; the area of each part is a unit fraction of the whole. **(See 5th Grade Common Core)**	**three-dimensional shapes**	G.GS.03.03 Identify parallel faces of rectangular prisms, in familiar shapes and in the classroom. **Name and explore properties of shapes** 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. 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. **Explore and name three-dimensional solids** G.GS.03.06 Identify, describe, build and classify familiar three-dimensional solids, based on their component parts (faces, surfaces, bases, edges, vertices).

Fourth Grade

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Continuing to develop understanding and fluency with whole number multiplication, and developing understanding of multi-digit whole number division	**Number—Operations and the Problems They Solve 4-NOP** **Multiplication and division** 1. Find the factor pairs for a given whole number less than or equal to 100; recognize prime numbers as numbers greater than 1 with exactly one factor pair. *Example: The factor pairs of 42 are {42, 1}, {21, 2}, {14, 3}, {7, 6}.* **Problem solving with the four operations** 2. Solve multi-step word problems involving the four operations with whole numbers. 3. Solve problems posed with both whole numbers and fractions. Understand that while quantities in a problem might be described with whole numbers, fractions, or decimals, the operations used to solve the problem depend on the relationships between the quantities regardless of which number representations are involved. 4. Assess the reasonableness of answers using mental computation and estimation strategies including rounding to the nearest 10 or 100. **Number—Base Ten 4-NBT** **Numbers up to 100,000** 1. Understand that a digit in one place represents ten times what it represents in the place to its right. *For example, 7 in the thousands place represents 10 times as many as than 7 in the hundreds place.* 2. Read, write and compare numbers to 100,000 using base-ten notation, number names, and expanded form. **Multiplying and dividing in base ten** 3. Understand how the distributive property and the expanded form of a multi-digit number can be used to calculate products of multi-digit numbers. a. The product of a one-digit number times a multi-digit number is the sum of the products of the one-digit number with the summands in the expanded form of the multi-digit number. Illustrate this numerically and visually using equations, rectangular arrays, area models, and tape diagrams. b. Algorithms for multi-digit multiplication can be derived and explained by writing multi-digit numbers in expanded form and applying the distributive property. 4. Fluently multiply and divide within 100. By end of Grade	**Developing fluency with multiplication of whole numbers**	**Use factors and multiples** 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, e.g., since 100 = 4 x 25, and 200 = 2 x 100, then 200 = 2 x 4 x 25 = 8 x 25. **Estimate** 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. **Understand and use number notation and place value** N.ME.04.01 Read and write numbers to 1,000,000; relate them to the quantities they represent; compare and order. N.ME.04.02 Compose and decompose numbers using place value to 1,000,000's. 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. **Multiply and divide whole numbers** N.ME.04.09 Multiply two-digit numbers by 2, 3, 4, and 5, using the distributive property. 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.

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	4, know from memory products of one-digit numbers where one of the factors is 6, 7, 8, or 9. 5. Mentally calculate products of one-digit numbers and one-digit multiples of 10, 100, and 1000 (e.g., 7 × 6000). Mentally calculate whole number quotients with divisors of 10 and 100. 6. Compute products and whole number quotients of two-, three- or four-digit numbers and one-digit numbers, and compute products of two two-digit numbers, using strategies based on place value, the properties of operations, and/or the inverse relationship between multiplication and division; explain the reasoning used. 7. Explain why multiplication and division strategies and algorithms work, using place value and the properties of operations. 8. Compute products of two-digit numbers using the standard algorithm, and check the result using estimation. 9. Given two whole numbers, find an equation displaying the largest multiple of one which is less than or equal to the other.		N.FL.04.11 Divide numbers up to four-digits by one-digit numbers and by 10. N.FL.04.12 Find unknowns in equations such as $a \div 10 = 25; 125 \div b = 25$ N.MR.04.13 Use the relationship between multiplication and division to simplify computations and check results. N.MR.04.14 Solve applied problems involving whole number multiplication and division.
Developing an understanding of addition and subtraction of fractions with like denominators, multiplication of fractions by whole numbers, and division of whole numbers with fractional answers	**Number—Fractions 4-NF** **Operations on fractions** 1. Understand addition of fractions: a. Adding or subtracting fractions with the same denominator means adding or subtracting copies of unit fractions. b. Sums of related fractions can be computed by replacing one with an equivalent fraction that has the same denominator as the other. 2. Compute sums and differences of fractions with like denominators, add and subtract related fractions within 1 (e.g., 1/2 + 1/4, 3/10 + 4/100, 7/8 – 1/4), and solve word problems involving these operations. 3. Understand that the meaning of multiplying a fraction by a whole number comes from interpreting multiplication by a whole number as repeated addition. *For example, 3 × 2/5 = 6/5 because 3 × 2/5 = 2/5 + 2/5 + 2/5 = 6/5.* 4. Solve word problems that involve multiplication of fractions by whole numbers; represent multiplication of fractions by whole numbers using tape diagrams and area models that explain numerical results. 5. Understand that fractions give meaning to the quotient of any whole number by any non-zero whole number. 6. Solve word problems that involve non-whole number quotients of whole numbers; represent quotients of	**Developing an understanding of fractions and decimals, including the connections between them**	**Add and subtract fractions** 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. 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). N.MR.04.29 Solve for the unknown in equations such as: $\frac{1}{8} + x = \frac{5}{8}$ or $\frac{3}{4} - y = \frac{1}{2}$. **Multiply fractions by whole numbers** N.MR.04.30 Multiply fractions by whole numbers, using repeated addition and area or array models.

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	whole numbers using tape diagrams and area models that explain numerical results. **Decimal concepts** 7. Understand that a two-digit decimal is a sum of fractions with denominators 10 and 100. *For example, 0.34 is 3/10 + 4/100.* 8. Use decimals to hundredths to describe parts of wholes; compare and order decimals to hundredths based on meanings of the digits; and write fractions of the form a/10 or a/100 in decimal notation. *Use > and < symbols to record the results of comparisons.*		**Read, interpret and compare decimal fractions** N.ME.04.15 Read and interpret decimals up to two decimal places; relate to money and place value decomposition. N.ME.04.17 Locate tenths and hundredths on a number line. N.ME.04.18 Read, write, interpret, and compare decimals up to two decimal places. N.MR.04.19 Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths.
Developing an understanding of area	**Measurement and Data 4-MD** **The number line and units of measure** 1. Understand that the unit length on a number line (interval from 0 to 1) can be divided into parts of equal fractional length. Draw number line representations of problem situations involving length, height, and distance including fractional or decimal units. *For example, show distances along a race course to tenths of a mile on a number line, by dividing the unit length into 10 equal parts to get parts of length 1/10; the endpoint of the segment of 1/10 length from 0 represents 1/10 of a mile from the starting point of the race. In Grade 4, all numbers lines begin with zero.* **Perimeter and area** 2. Understand that if a region is decomposed into several disjoint pieces, then the area of the region can be found by adding the areas of the pieces (when these areas are expressed in the same units). 3. Apply the formulas for area of squares and rectangles. Measure and compute whole-square-unit areas of objects and regions enclosed by geometric figures which can be decomposed into rectangles. 4. Find one dimension of a rectangle, given the other dimension and the area or perimeter; find the length of one side of a square, given the area or perimeter. Represent these problems using equations involving a letter for the unknown quantity. **Angle measurement** 5. Understand what an angle is and how it is measured: a. An angle is formed by two rays with a common		**Understand fractions** N.ME.04.20 Understand fractions as parts of a set of objects. 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. N.MR.04.22 Locate and compare fractions on the number line, including improper fractions and mixed numbers with denominators of 12 or less. N.MR.04.23 Understand the relationships among halves, fourths and eighths, and among thirds, sixths and twelfths. 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. **Use perimeter and area formulas** 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. M.TE.04.07 Find one dimension of a rectangle given the other dimension and its perimeter or area. M.TE.04.08 Find the side of a square given its perimeter or area. M.PS.04.09 Solve contextual problems about perimeter and area of squares and rectangles in compound shapes. **Understand right angles** M.TE.04.10 Identify right angles and compare angles to right angles.

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	endpoint. b. An angle is measured by reference to a circle with its center at the common endpoint of the rays. The measure of an angle is based on the fraction of the circle between the points where the two rays intersect the circle. c. A one-degree angle turns through 1/360 of a circle, where the circle is centered at the common endpoint of its rays; the measure of a given angle is the number of one-degree angles turned with no gaps or overlaps. 6. Measure angles in whole-number degrees using a protractor; sketch angles of specified measure; find the measure of a missing part of an angle, given the measure of the angle and the measure of a part of it, representing these problems with equations involving a letter for the unknown quantity. **Representing and interpreting data** 7. Make a dot plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in dot plots. *For example, from a dot plot find and interpret the difference in length* **[Found in Common Core at various other grade levels]**		**[See also 5th grade GLCE]** **Measure using common tools and appropriate units** M.UN.04.01 Measure using common tools and select appropriate units of measure. M.PS.04.02 Give answers to a reasonable degree of precision in the context of a given problem. M.UN.04.03 Measure and compare integer temperatures in degrees. M.TE.04.04 Measure surface area of cubes and rectangular prisms by covering and counting area of the faces. **Represent and solve problems for given data** 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.
Understanding that geometric figures can be analyzed and	Geometry 4-G **Lines and angles** 1. Draw points, lines, line segments, rays, angles, and perpendicular and parallel lines; identify these in plane figures. 2. Identify right angles, and angles smaller than or greater than a right angle in geometric figures; recognize right		**Understand perpendicular, parallel, and intersecting lines** G.GS.04.01 Identify and draw perpendicular, parallel, and intersecting lines using a ruler and a tool or object with a square (90°) corner. **Identify basic geometric shapes and their components, and solve problems**

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classified using properties such as having parallel sides, perpendicular sides, particular angle measures, and symmetry	triangles. 3. Classify shapes based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of specified size. **Line symmetry** 4. Understand that a line of symmetry for a geometric figure is a line across the figure such that the figure can be folded along the line into matching parts 5. Identify line-symmetric figures; given a horizontal or vertical line and a drawing that is not a closed figure, complete the drawing to create a figure that is symmetric with respect to the given line.		G.GS.04.02 Identify basic geometric shapes, including isosceles, equilateral and right triangles, and use their properties to solve problems. **Recognize symmetry and transformations** G.TR.04.04 Recognize plane figures that have line symmetry. G.TR.04.05 Recognize rigid motion transformations of a two-dimensional object.

Fifth Grade

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Developing understanding of and fluency with division of multi-digit whole numbers **Developing understanding of and fluency with addition, subtraction, multiplication, and division of decimals**	**Number—Base Ten 5-NBT** **Dividing whole numbers in base ten** 1. Compute quotients of two-, three-, and four-digit whole numbers and two-digit whole numbers using strategies based on place value, the properties of operations, and/or the inverse relationship between multiplication and division; explain the reasoning used. 2. Explain why division strategies and algorithms work, using place value and the properties of operations. 3. Use the standard algorithm to compute quotients of two-, three- and four-digit whole numbers and two-digit whole numbers, expressing the results as an equation (e.g., 145 = 11 × 13 + 2 or 120 ÷ 7 = 17 1/7). **Decimal concepts** 4. Read, write, and compare numbers expressed as decimals. Understand that a digit in one place represents ten times what it represents in the place to its right. 5. Round decimals (to hundredths) to the nearest whole number. 6. Write fractions in decimal notation for fractions with denominators 2, 4, 5, 8, 10, and 100. **Operations on decimals** 7. Understand that in adding or subtracting finite decimals, one adds or subtracts like units (tenths and tenths, hundredths and hundredths, etc.) and sometimes it is necessary to compose or decompose a higher value unit. 8. Fluently find 0.1 more than a number and less than a number; 0.01 more than a number and less than a number; and 0.001 more than a number and less than a number, for numbers expressed as finite decimals. 9. Compute sums and differences of finite decimals by expressing the decimals as fractions and adding the fractions. 10. Compute sums, differences, products, and quotients of finite decimals using strategies based on place value, the properties of operations, and/or the inverse relationships between addition and subtraction and between multiplication and division; explain the reasoning used. *For example, transform 1.5 ÷ 0.3 into 15 ÷ 3 = 5.* 11. Explain why strategies and algorithms for computations with finite decimals work.	**Developing an understanding of and fluency with division of whole numbers**	**Understand division of whole numbers** 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 $a = bq + r$. N.MR.05.03 Write mathematical statements involving division for given situations. **Multiply and divide whole numbers** 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. **Understand meaning of decimal fractions and percentages** 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. **Multiply and divide by powers of ten** 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.

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	12. Use the standard algorithm for each of the four operations on decimals (to hundredths). 13. Solve word problems involving operations on decimals. **[See 6th Grade Common Core]**		**Find prime factorizations of whole numbers** 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. **Express, interpret, and use ratios; find equivalences** 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.
Developing understanding of and fluency with addition and subtraction of fractions, developing understanding of the multiplication of fractions and of division of fractions in limited cases	**Number—Fractions 5-NF** **Fraction equivalence** 1. Understand fraction equivalence: a. Multiplying the numerator and denominator of a fraction by the same nonzero whole number produces an equivalent fraction. b. Equivalent fractions correspond to the same point on a number line. c. When the numerators of equivalent fractions are divided by their denominators, the resulting quotients are the same. 2. Identify pairs of equivalent fractions; given two fractions with unlike denominators, find two fractions with the same denominator and equivalent to each. 3. Compare and order fractions with like or unlike denominators, e.g., by finding equivalent fractions with the same denominator, and describe the sizes of fractional quantities from a context with reference to the context. **Operations on fractions** 4. Understand that sums and differences of fractions with unlike denominators can be computed by replacing each with an equivalent fraction so that the resulting fractions have the same denominator. 5. Compute sums and differences of fractions with like or unlike denominators, and solve word problems involving addition and subtraction of fractions. Estimate fraction sums and differences to assess the reasonableness of results. 6. Understand that multiplying a fraction by *a*/*b* means taking *a* parts of a decomposition of the fraction into *b* equal parts. 7. Understand that the area of a rectangle with side lengths	**Developing an understanding of and fluency with addition and subtraction of fractions and decimals**	**Add and subtract fractions using common denominators** 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. **Solve applied problems with fractions** N.FL.05.18 Given an applied situation involving addition and subtraction of fractions, write mathematical statements describing the situation. N.MR.05.19 Solve word problems that involve finding sums and differences of fractions with unlike denominators, using knowledge of equivalent fractions. N.FL.05.20 Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness; use examples involving money. **Understand fractions as division statements; find equivalent fractions** N.ME.05.10 Understand a fraction as a statement of division, using simple fractions and pictures to represent. 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. **Multiply and divide fractions** N.ME.05.12 Find the product of two unit fractions with

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	a/b and *c/d* is the product *a/b* × *p/q*. This extends the area formula for rectangles to fractional side lengths, and also allows products of fractions to be represented visually as areas of rectangles. 8. Explain and justify the properties of operations with fractions, e.g., by using equations, number line representations, area models, and story contexts. 9. Understand division of unit fractions by whole numbers and division of whole numbers by unit fractions: a. Dividing a unit fraction 1/b by a whole number a results in a smaller unit fraction 1/a × b. *(Using the inverse relationship between multiplication and division: 1/3 ÷ 2 = 1/6 because 1/6 × 2 = 1/3.)* b. Dividing a whole number a by a unit fraction 1/b results in a greater whole number a × b. *(Using the inverse relationship between multiplication and division: 2 ÷ 1/3 = 6 because 6 × 1/3 = 2.)* 10. Calculate products of fractions, and quotients of unit fractions and nonzero whole numbers (with either as divisor), and solve word problems involving these operations. Represent these operations using equations, area models and length models. 11. Understand that a mixed number such as 3 2/5 represents the sum of a whole number and a fraction less than one. Because a whole number can be represented as a fraction (3 = 3/1), and the sum of two fractions is also a fraction, a mixed number also represents a fraction (3 2/5 = 3 + 2/5 = 15/5 + 2/5 = 17/5). Write fractions as equivalent mixed numbers and vice versa.		small denominators using area model. N.MR.05.13 Divide a fraction by a whole number and a whole number by a fraction, using simple unit fractions.
	Measurement and Data 5-MD **Units of measure** 1. Understand that quantities expressed in like units can be added or subtracted giving a sum or difference with the same unit; different quantities may be multiplied to obtain a new kind of quantity (e.g., as when two lengths are multiplied to compute an area, or when an area and a length are multiplied to compute a volume). 2. Understand that when measuring a quantity, if a smaller unit is used, more units must be iterated to measure the quantity in those units. 3. Convert among different-sized standard measurement units within a given measurement system (e.g., feet to yards, centimeters to meters) and use conversion in solving multi-step word problems. **Volume** 4. Understand concepts of volume measurement:	**Developing**	**Know, and convert among, measurement units within a given system** M.UN.05.01 Recognize the equivalence of 1 liter, 1000 ml and 1000 cm3 and include conversions among liters, milliliters, and cubic centimeters. M.UN.05.02 Know the units of measure of volume: and use their abbreviations. M.UN.05.03 Compare the relative sizes of one cubic inch to one cubic foot, and one cubic centimeter to one cubic meter. M.UN.05.04 Convert measurements of length, weight, area, volume, and time within a given system. **Understand the concept of volume** M.TE.05.08 Build solids with unit cubes and state their

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	a. A cube with side length 1 unit (a unit cube) is said to have "one cubic unit" of volume, and can be used to measure volume. b. The volume of a right rectangular prism with whole-unit side lengths can be found by packing it with unit cubes and using multiplication to count their number. c. When measuring a volume, if a smaller unit is used, more units must be iterated to measure the volume in those units. d. If a solid figure is decomposed into several disjoint pieces, then the volume enclosed by the figure can be found by adding the volumes of the pieces (when these volumes are expressed in the same units). 5. Decompose right rectangular prisms into layers of arrays of cubes; determine and compare volumes of right rectangular prisms, and objects well described as right rectangular prisms, by counting cubic units (using cm3, m3, in3, ft3, and improvised units). **Representing and interpreting data** 6. Make a dot plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in dot plots. *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 the beakers were redistributed equally.*	**understanding of volume**	volumes. M.TE.05.09 Use filling (unit cubes or liquid), and counting or measuring to find the volume of a cube and rectangular prism. M.PS.05.10 Solve applied problems about the volumes of rectangular prisms using multiplication and division and using the appropriate units. **Construct and interpret line graphs** D.RE.05.01 Read and interpret line graphs, and solve problems based on line graphs, e.g., distance - time graphs, and problems with two or three line graphs on same axes, comparing different data. D.RE.05.02 Construct line graphs from tables of data; include axis labels and scale. **Find and interpret mean and mode for a given set of data** D.AN.05.03 Given a set of data, find and interpret the mean (using the concept of fair share) and mode.
Connections	**Geometry 5-G** **Coordinates** 1. Understand that a pair of perpendicular number lines, called axes, defines a coordinate system. a. Their intersection is called the origin, usually arranged to coincide with the 0 on each line. b. A given point in the plane can be located by using an ordered pair of numbers, called its coordinates. The first number indicates how far to travel from the origin in the		

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	direction of one axis, the second number indicates how far to travel in the direction of the second axis. c. To avoid ambiguity, conventions dictate that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate). 2. Graph points in the first quadrant of the coordinate plane, and identify the coordinates of graphed points. Where ordered pairs arise in a problem situation, interpret the coordinate values in the context of the situation. **Plane figures** 3. Understand that properties belonging to a category of plane figures also belong to all subcategories of that category. 4. Classify plane figures in a hierarchy based on properties. **(These are all addressed in various grades in the Common Core.)**	**Analyzing properties of two-dimensional shapes, including angles**	**Find areas of geometric shapes using formulas** 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. **Know the meaning of angles, and solve problems** 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. **Solve problems about geometric shapes** 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.

Sixth Grade

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Connecting ratio and rate to whole number multiplication and division	**Ratios and Proportional Relationships** **Ratios** 1. Understand the concept of a ratio: Two quantities are said to be in a ratio of a to b when for every a units of the first quantity there are b units of the second. 2. 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. 3. Solve for an unknown quantity in a problem involving two equal ratios. 4. Describe categorical data sets using ratios (e.g., for every vote candidate A received, candidate C received nearly three votes; the ratio of type O blood donors to type B blood donors was 9:2). **Unit rates** 5. Understand that for a ratio a:b, the corresponding unit rate is a/b. If there are a units of the first quantity for every b units of the second, where b ≠ 0, then there are a/b units of the first quantity for 1 unit of the second. For example, if a recipe has a ratio of 3 cups of flour to 4 cups of sugar, then there is 3/4 cup of flour for each cup of sugar. 6. Solve unit rate problems including unit pricing and constant speed, including reasoning with equations such as d = r × t, r= d/t, t = d ÷ r.	**Developing an understanding of operations on all rational numbers**	**Find equivalent ratios** N.ME.06.11 Find equivalent ratios by scaling up or scaling down. **Solve decimal, percentage and rational number problems** 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. **Represent rational numbers as fractions or decimals** N.ME.06.05 Order rational numbers and place them on the number line. N.ME.06.06 Represent rational numbers as fractions or terminating decimals when possible, and translate between these representations. N.ME.06.07 Understand that a fraction or a negative fraction is a quotient of two integers. **Calculate rates** A.PA.06.01 Solve applied problems involving rates, including speed.
Developing understanding of and fluency with division of fractions and developing fluency with multiplication of fractions	**The Number System 6-NS** **Operations on fractions** 1. Understand that the properties of operations apply to, and can be used with, addition and multiplication of fractions. 2. Understand that division of fractions is defined by viewing a quotient as the solution for an unknown-factor multiplication problem. For example, (2/3) ÷ (5/7) = 14/15 because (5/7) × (14/15) = (2/3). 3. Solve word problems requiring arithmetic with fractions, using the properties of operations and converting between forms as appropriate; estimate to check reasonableness of answers. **The system of rational numbers**		**Understand rational numbers and their location on the**

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	4. Understand that a number is a point on the number line. 5. Understand that some quantities have opposite directions, such as elevation above and below sea level or money received and spent. These quantities can be described using positive and negative numbers. 6. Understand that number lines familiar from previous grades can be extended to represent negative numbers to the left of zero. Number lines can also be vertically oriented, as when a coordinate system is formed. Then the conventional terms "to the right of 0" and "to the left of 0" conventionally become "above 0" and "below 0." a. Two different numbers, such as 7 and –7, that are equidistant from zero on a number line are said to be opposites of one another. The opposite of the opposite of a number is the number itself, e.g., –(–3) = 3. The opposite of 0 is 0. b. The absolute value of a number q, written |q|, is its distance from zero, and is always positive or zero. c. Fractions and their opposites form a system of numbers called the rational numbers, represented by points on a number line. Whole numbers and their opposites form the integers, which are contained in the rational numbers. d. Previous ways of comparing positive numbers can be extended to the rational numbers. The statement p > q means that p is located to the right of q on a number line, while p < q means that p is located to the left of q on a number line. Comparisons can also be made by reasoning appropriately about signed quantities The way two numbers compare does not always agree with the way their absolute values compare. 7. Find and position rational numbers, including integers, on a number line. 8. Use rational numbers to describe quantities such as elevation, temperature, account balance and so on. Compare these quantities, recording the results of comparisons using > and < symbols. **The system of rational numbers** 9. Graph points and identify coordinates of points on the coordinate plane in all four quadrants. Where ordered pairs arise in a problem situation, interpret the coordinate values in the context of the situation		**number line** N.ME.06.19 Understand that 0 is an integer that is neither negative nor positive. 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. 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. **Understand the coordinate plane** 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.
	(See Common Core Grade 7)		**Understand rational numbers and their location on the number line**

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			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. **Add and subtract integers and rational numbers** N.MR.06.08 Understand integer subtraction as the inverse of integer addition; add and subtract integers, using integers from 10 to -10. N.FL.06.09 Add, subtract, multiply, and divide integers between -10 and 10; use number line and strip models for addition and subtraction. N.FL.06.10 Add, subtract, multiply and divide positive rational numbers fluently.
Writing, interpreting, and using expressions and equations	**Expressions and Equations 6-EE** **Expressions** 1. Understand that an expression records operations with numbers or with letters standing for numbers. For example, the expression 2 * (8 + 7) records adding 8 and 7 then multiplying by 2; the expression 5 – y records subtracting y from 5. Focus on the operations of addition, subtraction, multiplication and division, with some attention to square or cube roots. 2. Understand the use of variables in expressions and algebraic conventions: a. A letter is used to stand for a number in an expression in cases where the number is unknown, or where, for the purpose at hand, it can be any number in a domain of interest. Such a letter is called a variable. b. If a variable appears in an expression more than once (e.g., as in t + 3t), that variable is understood to refer to the same number in each instance. c. The multiplication symbol can be omitted when writing products of two or more variables or of a number and a variable. 3. Describe the structure and elements of simple expressions using correct terminology (sum, term, product, factor, quotient, coefficient); describe an expression by viewing one or more of its parts as a single entity. For example, describe the expression 2 * (8 + 7) as a product of two factors, by viewing (8 + 7) as a single entity. The second factor is itself a sum of two terms. 4. Understand and generate equivalent expressions: a. Understand that two expressions are equivalent if they name the same number regardless of which numbers the variables in them stand for.	**Writing, interpreting, and using mathematical expressions and equations and solving linear equations**	**Use variables, write expressions and equations, and combine like terms** A.FO.06.03 Use letters, with units, to represent quantities in a variety of contexts. A.FO.06.04 Distinguish between an algebraic expression and an equation. A.FO.06.05 Use standard conventions for writing algebraic expressions. A.FO.06.06 Represent information given in words using algebraic expressions and equations. A.FO.06.07 Simplify expressions of the first degree by combining like terms, and evaluate using specific values. **Solve equations** A.FO.06.11 Relate simple linear equations with integer coefficients to particular contexts. 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. 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. A.FO.06.14 Solve equations of the form ax + b = c, e.g., 3x + 8 = 15, by hand for positive integer coefficients less than 20, using calculators otherwise, and interpret the results. **Represent linear functions using tables, equations, and graphs** A.RP.06.08 Understand that graphs and tables can suggest relationships between quantities. A.PA.06.09 Graph and write equations for linear functions of the form y = mx and solve related problems. A.RP.06.10 Represent simple relationships between quantities, use verbal descriptions, formulas or equations, tables, and graphs.

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	b. Understand that applying the laws of arithmetic to an expression results in an equivalent expression. c. Generate equivalent expressions to reinterpret the meaning of an expression. **Quantitative relationships and the algebraic approach to problems** 5. Understand that an equation is a statement that two expressions are equal, and a solution to an equation is a replacement value of the variable (or replacement values for all the variables if there is more than one) that makes the equation true. 6. Using the idea of maintaining equality between both sides of the equation, solve equations of the form x + p = q and px = q for cases in which p, q and x are all non-negative rational numbers. 7. Choose variables to represent quantities in a word problem, and construct simple expressions or equations to solve the problem by reasoning about the quantities. 8. Understand that a variable can be used to represent a quantity that can change, often in relationship to another changing quantity, and an equation can express one quantity, thought of as the dependent variable, in terms of other quantities, thought of as the independent variables; represent a relationship between two quantities using equations, graphs, and tables; translate between any two of these representations. For example, describe the terms in a sequence t = 3, 6, 9, 12, ... of multiples of 3 by writing the equation t = 3n for n = 1, 2, 3, 4, ….		
Developing understanding of and using formulas to determine areas of two-dimensional shapes and distinguishing between volume and surface area of three-dimensional shapes	**Geometry 6-G** **Properties of area, surface area, and volume** 1. Understand that plane figures can be decomposed, reassembled, and completed into new figures; use this technique to derive area formulas. 2. Find the areas enclosed by right triangles, other triangles, special quadrilaterals, and polygons (by composing into rectangles or decomposing into triangles and other shapes). 3. Understand that three-dimensional figures can be formed by joining rectangles and triangles along their edges to enclose a solid region with no gaps or overlaps. The surface area is the sum of the areas of the enclosing rectangles and triangles. 4. Find the surface area of cubes, prisms and pyramids	**Describing three-dimensional shapes and analyzing their properties, including volume and surface area**	**Convert within measurement systems** M.UN.06.01 Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet. **Find volume and surface area** M.PS.06.02 Draw patterns (of faces) for a cube and rectangular prism that, when cut, will cover the solid exactly (nets). M.TE.06.03 Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.

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	(include the use of nets to represent these figures). 5. Solve problems involving area, volume and surface area of objects. 6. Give examples of right rectangular prisms with the same surface area and different volumes, and with the same volume and different surface areas. **Properties of area, surface area, and volume** 7. Use exponents and symbols for square roots and cube roots to express the area of a square and volume of a cube in terms of their side lengths, and to express their side lengths in terms of their area or volume.		**Use exponents** N.ME.06.16 Understand and use integer exponents, excluding powers of negative numbers; express numbers in scientific notation.
	[See 8th Grade Common Core]		**Understand and apply basic properties** G.GS.06.01 Understand and apply basic properties of lines, angles, and triangles, including: • triangle inequality • relationships of vertical angles, complementary angles, supplementary angles • congruence of corresponding and alternate interior angles when parallel lines are cut by a transversal, and that such congruencies imply parallel lines • 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 • know that the sum of the exterior angles of a convex polygon is 360º. **Understand the concept of congruence and basic transformations** G.GS.06.02 Understand that for polygons, congruence means corresponding sides and angles have equal measures. 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. G.TR.06.04 Understand and use simple compositions of basic rigid transformations, e.g., a translation followed by a reflection. **Construct geometric shapes** G.SR.06.05 Use paper folding to perform basic geometric constructions of perpendicular lines, midpoints of line segments and angle bisectors; justify informally.
	[See 7th Grade and High School Common Core]	**Connections**	**Understand the concept of probability and solve problems** D.PR.06.01 Express probabilities as fractions, decimals or percentages between 0 and 1; know that 0 probability means an event will not occur, and that probability 1

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			means an event will occur. D.PR.06.02 Compute probabilities of events from simple experiments with equally likely outcomes, e.g., tossing dice, flipping coins, spinning spinners, by listing all possibilities and finding the fraction that meets given conditions.
	Statistics and Probability 6-SP **Variability and measures of center** 1. Understand that a statistical question is one that anticipates variability in the data related to the question and accounts for it in the answers. 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. 2. Understand that a set of data generated by answers to a statistical question typically shows variability—not all of the values are the same—and yet often the values show an overall pattern, often with a tendency to cluster. a. A measure of center for a numerical data set summarizes all of its values using a single number. The median is a measure of center in the sense that approximately half the data values are less than the median, while approximately half are greater. The mean is a measure of center in the sense that it is the value that each data point would take on if the total of the data values were redistributed fairly, and in the sense that it is the balance point of a data distribution shown on a dot plot. b. A measure of variation for a numerical data set describes how its values vary using a single number. The interquartile range and the mean absolute deviation are both measures of variation. **Summarizing and describing distributions** 3. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 4. Summarize numerical data sets, such as by: a. Reporting the number of observations. b. Describing the nature of the variable, including how it was measured and its units of measurement. Data sets can include fractional values at this grade but not negative values. c. Describing center and variation, as well as describing any overall pattern and any striking deviations from the overall pattern. 5. Relate the choice of the median or mean as a measure		**(These are all addressed in various grades in the GLCE.)**

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	of center to the shape of the data distribution being described and the context in which it is being used. Do the same for the choice of interquartile range or mean average deviation as a measure of variation.		

Seventh Grade

Common Core Standards Critical Areas	Common Core Core Standards: Students Can and Do	Michigan Focal Point	Michigan GLCE Topics Expectations
Developing understanding of and applying proportional relationships	**Ratios and Proportional Relationships 7-RP** **Analyzing proportional relationships** 1. Form ratios of non-negative rational numbers and compute corresponding unit rates. Include ratios of lengths, areas and other quantities, including when quantities being compared are measured in different units. 2. Recognize situations in which two quantities covary and have a constant ratio. (The quantities are then said to be in a proportional relationship and the unit rate is called the constant of proportionality.) Decide whether two quantities that covary are in a proportional relationship, e.g., by testing for equivalent ratios or graphing on a coordinate plane. 3. Compute unit rates and solve proportional relationship problems in everyday contexts, such as shopping, cooking, carpentry, party planning, etc. Represent proportional relationships by equations that express how the quantities are related via the constant of proportionality or unit rate. 4. Plot proportional relationships on a coordinate plane where each axis represents one of the two quantities involved, observe that the graph is a straight line through the origin, and find unit rates from a graph. Explain what a point (x, y) means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. 5. Compare tables, graphs, formulas, diagrams, and verbal descriptions that represent or partially represent proportional relationships; explain correspondences among the representations including how the unit rate is shown in each. **Percent** 6. Understand that percentages are rates per 100. For example, 30% of a quantity means 30/100 times the quantity. A percentage can be a complex fraction, as in 3.75% = 3.75/100. 7. Find a percentage of a quantity; solve problems involving finding the whole given a part and the percentage. 8. Solve multi-step percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error, expressing monthly rent as a percentage of take-home pay.	**Developing an understanding of and applying proportionality, including similarity**	**Understand and solve problems involving rates, ratios, and proportions** 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 a/b = c/d; know how to see patterns about proportional situations in tables. **Understand and apply directly proportional relationships and relate to linear relationships** 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 $y = kx$ for specific x values, given k. 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 $y = mx$, and distinguish from linear relationships of the form $y = mx + b$, b non-zero; understand that in a directly proportional relationship between two quantities one quantity is a constant multiple of the other quantity. **[See 5th and 6th Grade GLCE]**

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Developing understanding of operations with rational numbers and solving linear equations	**(Understanding properties begins with 1st Grade in Common Core)** **The Number System 7-NS** **The system of rational numbers** 1. Understand that the rules for manipulating fractions extend to complex fractions. 2. Understand and perform addition and subtraction with rational numbers: a. Understand that on a number line, the sum p + q is the number located a distance |q| from p, to the right of p if q is positive and to the left of p if q is negative. A number and its opposite are additive inverses (i.e., their sum is zero). b. Compute sums of signed numbers using the laws of arithmetic. For example, 7 + (−3) = 4 because 7 + (−3) = (4 + 3) + (−3) = 4 + [3 + (−3)] = 4 + [0] = 4. c. Understand that subtraction of rational numbers is defined by viewing a difference as the solution of an unknown addend addition problem. Subtraction of a rational number gives the same answer as adding its additive inverse. d. Explain and justify rules for adding and subtracting rational numbers, using a number line and practical contexts. For example, relate r + (−s) = r − s to a bank transaction; explain why p − (q + r) = p − q − r. e. Understand that the additive inverse of a sum is the sum of the additive inverses, that is −(p + q) = −p + −q. For example, −(6 + −2) = (−6) + 2 because [6 + (−2)] + [(−6) + 2] = [6 + (−6)] + [(−2) + 2] = [0] + [0] = 0. 3. Understand and perform multiplication and division with rational numbers: a. Understand that the extension of multiplication from fractions to rational numbers is determined by the requirement that multiplication and addition satisfy the laws of arithmetic, particularly the distributive law, leading to products such as (−1)(−1) = 1 and the rules for multiplying signed numbers. 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 p/q is a rational number, then −(p/q) = (−p)/q = p/(−q). c. Calculate products and quotients of rational numbers, and use multiplication and division to solve word problems. Include signed quantities.		**Apply basic properties of real numbers in algebraic contexts** 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. **Compute with rational numbers** N.FL.07.07 Solve problems involving operations with integers. N.FL.07.08 Add, subtract, multiply and divide negative rational numbers. N.FL.07.09 Estimate results of computations with rational numbers. **(See also 6th Grade GLCE)**

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	The system of real numbers 4. Understand that there are numbers that are not rational numbers, called irrational numbers, e.g., π and √2. Together the rational and irrational numbers form the real number system. In school mathematics, the real numbers are assumed to satisfy the laws of arithmetic.		
	Expressions and Equations 7-EE **Expressions** 1. Interpret numerical expressions at a level necessary to calculate their value using a calculator or spreadsheet. For expressions with variables, use and interpret conventions of algebraic notation, such as y/2 is y ÷ 2 or 1/2 × y; (3 ± y)/5 is (3 ± y) ÷ 5 or 1/5 × (3 ± y); a2 is a × a, a3 is a × a × a, a2b is a × a × b. 2. Generate equivalent expressions from a given expression using the laws of arithmetic and conventions of algebraic notation. Include: a. Adding and subtracting linear expressions, as in (2x + 3) + x + (2 – x) = 2x + 5. b. Factoring, as in 4x + 4y = 4(x + y) or 5x + 7x + 10y + 14y = 12x + 24y = 12(x + 2y). c. Simplifying, as in –2(3x – 5) + 4x = 10 – 2x or x/3 + (x – 2)/4 = 7x/12 – 1/2. **Quantitative relationships and the algebraic approach to problems** 3. Choose variables to represent quantities in a word problem, and construct simple equations to solve the problem by reasoning about the quantities. a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are non-negative rational numbers and the solution is a non-negative rational number. Fluently solve equations of these forms, e.g., by undoing the operations involved in producing the expression on the left. b. Solve the same word problem arithmetically and algebraically. For example, "J. has 4 packages of balloons and 5 single balloons. In all, he has 21 balloons. How many balloons are in a package?" Solve this problem arithmetically (using a sequence of operations on the given numbers), and also solve it by using a variable to stand for the number of balloons in a package, constructing an equation such as 4b + 5 = 21 to describe the situation then solving the equation. c. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For	**Analyzing and representing linear functions and solving linear equations and systems of linear equations**	**Combine algebraic expressions and solve equations** A.FO.07.12 Add, subtract and multiply simple algebraic expressions of the first degree, e.g., (92x + 8y) – 5x + y, or – 2x (5x – 4), and justify using properties of real numbers. [Core] A.FO.07.13 From applied situations, generate and solve linear equations of the form ax + b = c and ax + b = cx + d, and interpret solutions. [Ext]

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	example, P + 0.05P = 1.05P means that "increase by 5%" is the same as "multiply by 1.05." **[See 8th Grade Common Core]**		**Understand and represent linear functions** 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. A.PA.07.07 Represent linear functions in the form y = x + b, y = mx, and y = mx + b, and graph, interpreting slope and y-intercept. A.FO.07.08 Find and interpret the x and/or y intercepts of a 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.
Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence	**Geometry 7-G** **Congruence and similarity** 1. Verify experimentally the fact that a rigid motion (a sequence of rotations, reflections, and translations) preserves distance and angle, e.g., by using physical mo dels, transparencies, or dynamic geometry software: 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 the meaning of congruence: a plane figure is congruent to another if the second can be obtained from the first by a rigid motion. 3. Verify experimentally that a dilation with scale factor k preserves lines and angle measure, but takes a line segment of length L to a line segment of length kL. 4. Understand the meaning of similarity: a plane figure is similar to another if the second can be obtained from the first by a similarity transformation (a rigid motion followed by a dilation). 5. Solve problems involving similar figures and scale drawings. Include computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 6. Use informal arguments involving approximation by lines, squares, and cubes to see that a similarity transformation with a scale factor of k leaves angle measures unchanged, changes lengths by a factor of k, changes areas by a factor of k2, and changes volumes by a factor of k3. 7. Know the formulas relating the area, radius and circumference of a circle and solve problems requiring the use of these formulas; give an informal derivation of the relationship between the circumference and area of a		**Understand the concept of similar polygons, and solve related problems** 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. G.TR.07.06 Understand and use the fact that when two triangles are similar with scale factor of r, their areas are related by a factor of r^2. **[Area of circle addressed in 8th Grade GLCE]**

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	circle. **Angles** 8. Justify facts about the angle sum of triangles, exterior angles, and alternate interior angles created when parallel lines are cut by a transversal, e.g., by using physical models, transparencies, or dynamic geometry software to make rigid motions and give informal arguments. For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so. 9. 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. **[See High School Common Core]**	**Connections**	**Draw and construct geometric objects** 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.
Drawing inferences about populations based on samples	**Statistics and Probability 7-SP** **Situations involving randomness** 1. Simulate situations involving randomness using random numbers generated by a calculator or a spreadsheet or taken from a table. 2. Use proportional reasoning to predict relative frequencies of outcomes for situations involving randomness, but for which a theoretical answer can be determined. Use technology to generate multiple samples to approximate a distribution of sample proportions. Repeat the process for smaller sample sizes. **Random sampling to draw inferences about a population** 3. 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. 4. Understand the importance of measures of variation in sample quantities (like means or proportions) in reasoning about how well a sample quantity estimates or predicts the corresponding population quantity. 5. Use data from a random sample to draw inferences about		**[See 8th grade and High School Common Core]**

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	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. **Comparative inferences about two populations** 6. 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. 7. Use measures of center and measures of variability for numerical data from uniform random samples to draw informal comparative inferences about two populations. **[See 8th Grade Common Core]**	**Connections**	**Compute statistics about datasets** D.AN.07.03 Calculate and interpret relative frequencies and cumulative frequencies for given data sets. D.AN.07.04 Find and interpret the median, quartiles, and interquartile range of a given set of data.

Eighth Grade

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	The Number System 8-NS **The system of real numbers** 1. Understand informally that every number on a number line has a decimal expansion, which can be found for rational numbers using long division. Rational numbers are those with repeating decimal expansions (this includes finite decimals which have an expansion that ends in a sequence of zeros). 2. Informally explain why √2 is irrational. 3. Use rational approximations (including those obtained from truncating decimal expansions) to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions (e.g., π2).	**Connections**	**Understand real number concepts** 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…
Solving linear equations and systems of linear equations	**Expressions and Equations 8-EE** **Linear equations in one variable** 1. Understand that a linear equation in one variable might have one solution, infinitely many solutions, or no solutions. Which of these possibilities is the case can be determined by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results 2. Solve linear equations with rational number coefficients, including equations that require expanding expressions using the distributive law and collecting like terms. **Linear equations in two variables** 3. Understand that the slope of a non-vertical line in the coordinate plane has the same value for any two distinct points used to compute it. This can be seen using similar triangles. 4. Understand that two lines with well-defined slopes are parallel if and only if their slopes are equal. 5. Understand that the graph of a linear equation in two variables is a line, the set of pairs of numbers satisfying the equation. If the equation is in the form y = mx + b, the graph can be obtained by shifting the graph of y =mx by b units…The slope of the line is m. 6. Understand that a proportional relationship between two variable quantities y and x can be represented by the equation y = mx. The constant m is the unit rate, and tells how much of y per unit of x. 7. Graph proportional relationships and relationships defined by a linear equation; find the slope and interpret the slope	**Connections**	**Understand solutions and solve equations, simultaneous equations, and linear inequalities** A.FO.08.10 Understand that to solve the equation f(x) = g(x) means to find all values of x 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 3x2 + 2 = 4x + 2, but 1 is not a solution).

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	in context. 8. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. **Systems of linear equations** 9. 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. 10. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. 11. Solve and explain word problems leading to two linear equations in two variables. 12. Solve problems involving lines and their equations. For example, decide whether a point with given coordinates lies on the line with a given equation; construct an equation for a line given two points on the line or one point and the slope; given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. **(Inequalities in High School Common Core)**		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. A.FO.08.13 Set up and solve applied problems involving simultaneous linear equations and linear inequalities. A.FO.08.12 Solve linear inequalities in one and two variables, and graph the solution sets.
Grasping the concept of a function and using functions to describe quantitative relationships	**Functions 8-F** **Function concepts** 1. Understand that a function from one set (called the domain) to another set (called the range) is a rule that assigns to each element of the domain (an input) exactly one element of the range (the corresponding output). The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required in Grade 8. 2. Evaluate expressions that define functions, and solve equations to find the input(s) that correspond to a given output. 3. Compare properties of two functions represented in different ways (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear 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. 4. Understand that a function is linear if it can be expressed in the form $y = mx + b$ or if its graph is a straight line. For example,the function $y = x^2$ is not a linear function because its graph contains the points (1,1), (−1,1) and		**[See 7th Grade GLCE]**

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	(0,0), which are not on a straight line. **Functional relationships between quantities** 5. Understand that functions can describe situations where one quantity determines another. 6. 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; from two (x, y) 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. 7. Describe qualitatively the functional relationship between two quantities by reading a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. **[Addressed more deeply with Michigan HSCE; appears in High School Common Core]**	**Analyzing and representing non-linear functions**	**Understand the concept of non-linear functions using basic examples** A.RP.08.01 Identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships *(y = k/x)*; cubics *($y = ax^3$)*; roots *($y = \sqrt{x}$)*; and exponentials *($y = a^x$, $a > 0$)*; using tables, graphs, and equations. 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. 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. A.RP.08.04 Use the vertical line test to determine if a graph represents a function in one variable. **Understand and represent quadratic functions** 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 x-intercepts of the corresponding quadratic function. A.RP.08.06 Graph factorable quadratic functions, finding where the graph intersects the x-axis and the coordinates of the vertex; use words "parabola" and "roots"; include functions in vertex form and those with leading coefficient –1.
Understanding and applying the	**Geometry 8-G** **Congruence and similarity**		**[See 6th Grade GLCE]**

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Pythagorean Theorem.	1. Use coordinate grids to transform figures and to predict the effect of dilations, translations, rotations and reflections. 2. Explain using rigid motions the meaning of congruence for triangles as the equality of all pairs of sides and all pairs of angles. 3. Give an informal explanation using rigid motions of the SAS and ASA criteria for triangle congruence, and use them to prove simple theorems. 4. Explain using similarity transformations the meaning of similarity for triangles as the equality of all pairs of angles and the proportionality of all pairs of sides. 5. Give an informal explanation using similarity transformations of the AA and SAS criteria for triangle similarity, and use them to prove simple theorems. **The Pythagorean Theorem** 6. The side lengths of a right triangle are related by the Pythagorean Theorem. Conversely, if the side lengths of a triangles satisfy the Pythagorean Theorem, it is a right triangle. 7. Explain a proof of the Pythagorean Theorem and its converse. 8. Use the Pythagorean Theorem to determine unknown side lengths in right triangles and to solve problems in two and three dimensions. 9. Use the Pythagorean Theorem to find the distance between two points in a coordinate system. **Plane and solid geometry** 10. Draw (freehand, with ruler and protractor, and with technology) geometric shapes from given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the triangle is uniquely defined, ambiguously defined or nonexistent. 11. Understand that slicing a three-dimensional figure with a plane produces a two-dimensional figure. Describe plane sections of right rectangular prisms and right rectangular pyramids. 12. Use hands-on activities to demonstrate and describe properties of: parallel lines in space, the line perpendicular to a given line through a given point, lines perpendicular to a given plane, lines parallel to a given plane, the plane or planes passing through three given points, and the plane perpendicular to a given line at a given point. **[See High School Common Core]**	**Analyzing two- and three-dimensional space and figures by using distance and angle**	**Understand and use the Pythagorean Theorem** 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. **Solve problems about geometric figures** G.SR.08.03 Understand the definition of a circle; know and use the formulas for circumference and area of a circle to

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	[See 6th Grade Common Core] **[See 7th Grade Common Core]**	**Developing an understanding of and using formulas to determine surface areas and volumes of three-dimensional shapes**	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. **Understand concepts of volume and surface area, and apply formulas** G.SR.08.06 Know the volume formulas for generalized cylinders ((area of base) x height), generalized cones and pyramids (1/3 (area of base) x height), and spheres (4/3 π (radius) 3) 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. **Visualize solids** 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.
	Statistics and Probability 8-SP **Patterns of association in bivariate data** 1. Understand that scatter plots for bivariate measurement data may reveal patterns of association between two quantities. 2. Construct and interpret scatter plots for bivariate measurement data. Describe patterns such as clustering, outliers, positive or negative association, linear association, nonlinear association. 3. Understand that a straight line is a widely used model for exploring 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. 4. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. 5. 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	**Analyzing and summarizing data sets**	**Draw, explain, and justify conclusions based on data** 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.

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	categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. **(See High School Common Core)**	**Connections**	**Understand probability concepts for simple and compound events** 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. 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. D.PR.08.05 Find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event. D.PR.08.06 Understand the difference between independent and dependent events, and recognize common misconceptions involving probability.

[i] Common Core State Standards Draft 3/10/10
[ii] Domain (K-8); [at high school this level is called a Conceptual Category]
[iii] Cluster

[iv] Common Core State Standards Draft 3/10/10