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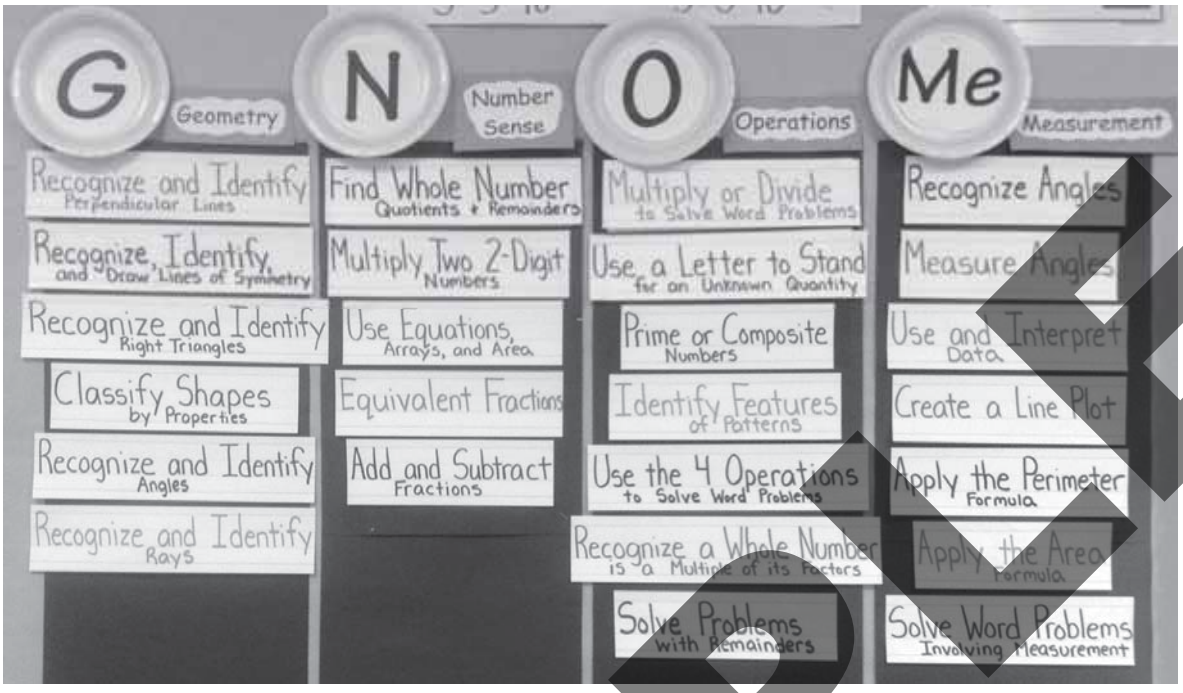
INTRODUCTION

Did you panic when you heard that your state was adopting the Common Core Standards?

If you are anything like us, you probably found yourself moving through the stages of panic, fear, curiosity, and, eventually, acceptance. At first we thought we were going to have to completely overhaul our entire curriculum and instruction. However, after exploring the Common Core Standards through professional development provided by our district, as well as on our own initiative, we came to the realization that we already had all of the tools needed to become a Common Core classroom.

After a few planning periods and lunch chats, we finally experienced our "aha" moment. What we would need to do is change the way we think about math instruction. The shift would come in the presentation of our lessons and in the way we ask our students to respond to math. The Common Core Standards mention shifts in the direction in which math is approached, so we needed to rethink the way in which we incorporated these standards into our math lessons and the level in which we allowed students to experience the content. The Common Core Standards take a constructivist approach to math learning. Therefore, students should be using their math knowledge to solve novel, real-world problems.

What we would need to do is change the way we think about math instruction.



We really wanted our students to take ownership of their learning and be aware of the high expectations that are placed on them. In order to do this in a student-friendly way, we came up with the acronym GNOMe, which stands for geometry, number sense, operations, and measurement. These are the domains that the Common Core Standards use in organizing the standards. We then rewrote the standards in short, student-friendly phrases by highlighting the core math concepts addressed.

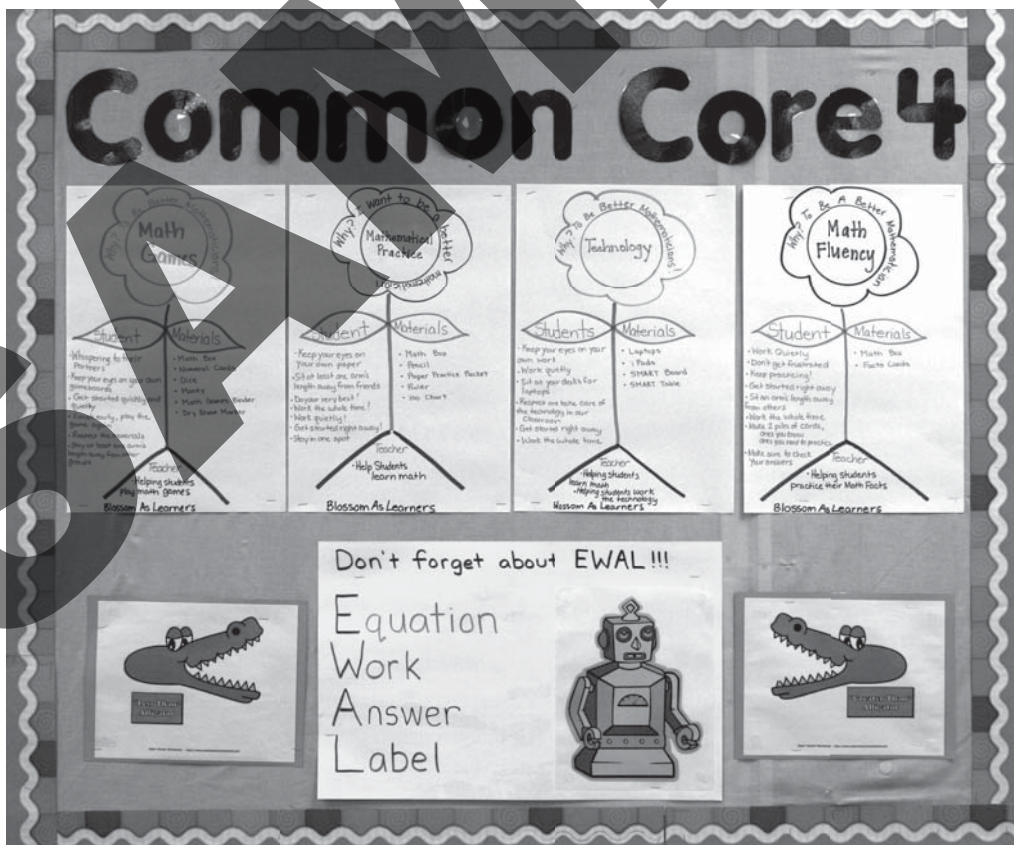
We couldn't think of a better way for students to grasp what they were expected to learn than by displaying the concepts to refer to throughout the day. Throughout the school year, as we introduce and teach the standards, we place each standard's core concepts under the corresponding domain (see Chapter 1 for more details). This is also a great way for us to make sure we are consistently teaching to the standards and are able to refer back to standards that were previously taught.

Next, we turned our attention to the setup of our math time. With the current emphasis on differentiation and individualized learning plans, we wanted to make sure our math block allowed us to work both one-on-one with individual students and in small groups with students who are all working on the same math skills. We decided that a mini-lesson followed by independent practice would work best. Marzano, Pickering, and Pollock (2001) discuss the

importance of helping students set high expectations and objectives for themselves as well as having teachers provide immediate feedback. The independent practice time allows teachers to conduct a conference and provide meaningful feedback to individual students while the rest of the class is working on a task.

How do we meet with students individually and not lose meaningful instruction time with those working independently?

This format posed another obstacle. How do we meet with students individually and not lose meaningful instruction time with those working independently? We did not want to assign "busy work" to our students. We want our students to be engaged in meaningful activities that support their learning. We also want to spend most of our time working with students, not making copies and grading papers. This led to the birth of the Common Core 4, which is based on the Common Core State Standards for Mathematical Practice (page 76). We decided that there are four main activities that students should experience on a regular, consistent basis



in order to support their math learning and growth. The Common Core 4 is composed of four kinds of activities: math fluency, math games, mathematical practice, and technology. (See Chapter 2 for more details.)

We also agreed that student choice needed to play a role in our math instruction. There is much research that shows students are more invested in their learning when they are interested in it. Katz and Assor (2007) discuss the impact that student choice can have on motivation, well-being, and achievement. What better way to appeal to the interest of students than by giving them choice when it comes to their learning. We decided to give students the opportunity to choose which one of the Common Core 4 they would like to work on and when.

Putting it all together, our math day eventually ended up looking like this: We teach a mini-lesson about a concept on the GNOMe board. That is followed by students choosing which one of the Common Core 4 activities they would like to work on independently. While students work independently, we meet with individuals or small groups to reinforce skills. We repeat this two to three times within our math block, resulting in two to three mini-lessons and two to three rounds of the Common Core 4 every day.

The Common Core 4 is composed of math fluency, math games, mathematical practice, and technology.

While we chose for the Common Core 4 to be the independent practice part of our math block, there are many other great math programs out there that would work equally as well in its place. If your school has a math series that you are required to use, the activities and lessons found in your series could take the place of the independent practice. Chapter 4 provides details and examples of how to set up your math block using the Math GNOMe with the Common Core 4, as well as with a variety of other options in place of the Common Core 4.

The Math GNOMe and Common Core 4 helped to align our instruction to the Common Core Standards with a simple shift in how we think about and present math. It is evident to anyone who walks into our classroom what standards we have taught and what standards students are working on. Our students are able to discuss math concepts and explain why they are learning a particular skill. We, as well as students, are able to refer back to the Math GNOMe board throughout the school year. The Math GNOMe has focused our attention on the expectations the standards place on our students, while the Common Core 4 allows us time to work with students individually in areas where they are struggling. It is amazing to be able to find the time to work one-on-one with students on a regular basis. Because of this individualized attention and ongoing formative assessment, students' growth is astounding.

The Math GNOMe and Common Core 4 work in conjunction with one another to allow you to have a truly Common Core classroom that addresses the six shifts in mathematics instruction—focus, coherence, fluency, deep understanding, application, and dual intensity. Through the Math GNOMe mini-lessons, teachers are able to provide instruction that has focus, coherence, and depth for greater understanding, while the Common Core 4 provides students with the opportunity to achieve fluency, application, and dual intensity. Your students will participate in independent, self-selected math activities while allowing you to provide individual and small-group instruction and assessment through conferences.

The Math GNOMe and Common Core 4 helped to align our instruction to the Common Core Standards with a simple shift in how we think about and present math.

Geometry *I Can...* Statements

STANDARD NUMBER	BULLETIN BOARD PHRASE(S)	I CAN STATEMENT(S)
4.G.A.1	Recognize and identify lines	I can draw points, lines, and line segments.
	Recognize and identify line segments	I can identify lines and line segments in 2-D figures.
	Recognize and identify rays	I can draw rays and angles (right, acute, obtuse).
	Recognize and identify angles	I can identify rays and angles in 2-D figures.
	Recognize and identify perpendicular lines	I can identify perpendicular lines in 2-D figures. I can draw perpendicular lines.
	Recognize and identify parallel lines	I can identify parallel lines in 2-D figures. I can draw parallel lines.
4.G.A.2	Classify shapes by properties	I can classify 2-D figures based their lines and angles.
	Recognize and identify right triangles	I can recognize and identify right triangles within 2-D figures.
4.G.A.3	Recognize and identify symmetrical shapes	I can identify figures that can be divided symmetrically.
		I can recognize and draw lines of symmetry in 2-D figures.

Number Sense *I Can...* Statements

STANDARD NUMBER	BULLETIN BOARD PHRASE(S)	I CAN STATEMENT(S)
4.NBT.A.1	Understand place value	I can determine that a digit represents ten times what it would be in the place to its right.
4.NBT.A.2	Read and write multi-digit whole numbers	I can read and write multi-digit whole numbers. I can read and write number names. I can read and write multi-digit numbers in expanded form.
	Compare numbers using <, =, >	I can compare multi-digit numbers using <, =, or >.
4.NBT.A.3	Round multi-digit whole numbers	I can round multi-digit whole numbers to any place.
4.NBT.B.4	Fluently add multi-digit numbers Fluently subtract multi-digit numbers	I can fluently add multi-digit numbers. I can fluently subtract multi-digit numbers.
4.NBT.B.5	Multiply up to a 4-digit number by a 1-digit number	I can multiply up to a four-digit number by a one-digit number. I can illustrate and explain the calculation using equations, rectangular arrays, and/or area models.
	Multiply two 2-digit numbers	I can multiply two two-digit numbers. I can illustrate and explain the calculation using equations, rectangular arrays, and/or area models.
4.NBT.B.6	Find whole-number quotients and remainders	I can find quotients and remainders with up to four-digit dividends and one-digit divisors. I can illustrate and explain the calculation.
4.NF.A.1, 4.NF.C.5	Understand equivalent fractions	I can use visual fraction models to recognize equivalent fractions. I can use visual fraction models to explain equivalent fractions. I can use visual models to generate equivalent fractions. I can express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions.
4.NF.A.2	Compare fractions with <, =, >	I can use <, =, or > to compare two fractions with different numerators and denominators. I can justify the calculation with a fraction model.
4.NF.B.3	Understand what a fraction is	I can understand a fraction is a/b with a>1 as a sum of fractions 1/b.
4.NF.B.3a, 4.NF.C.5	Add and subtract fractions	I can understand that addition and subtraction of fractions is joining and separating parts of the same whole.
4.NF.B.3b	Break apart a fraction into a sum of fractions	I can break apart a fraction into a sum of fractions with the same denominator in more than one way.
4.NF.B.3c	Add and subtract mixed numbers	I can add and subtract mixed numbers with like denominators.
4.NF.B.3d, 4.NF.B.4c	Solve word problems involving fractions	I can solve addition, subtraction, multiplication, and division word problems about fractions referring to the same whole and having like denominators.
4.NF.B.4, 4.NF.B.4a, 4.NF.B.4b	Multiply fractions by whole numbers	I can multiply a fraction by a whole number.
4.NF.C.6	Understand decimal notation for fractions	I can use decimal notation for fractions with denominators 10 or 100.
4.NF.C.7	Compare decimals with <, =, >	I can use <, =, or > to compare two decimals to hundredths. I can justify the conclusions.

Operations *I Can...* Statements

STANDARD NUMBER	BULLETIN BOARD PHRASE(S)	I CAN STATEMENT(S)
4.OA.A.1	Interpret multiplication equations as comparisons	I can explain how a multiplication equation can be used to compare.
4.OA.A.2	Multiply or divide to solve word problems	I can multiply or divide to solve word problems.
4.OA.A.3	Use the four operations (+, -, x, ÷) to solve word problems	I can use +, -, x, ÷ to solve multistep word problems with whole-number answers.
	Solve problems with remainders	I can use +, -, x, ÷ to solve multistep word problems with whole-number answers and remainders.
	Use a letter to stand for an unknown quantity	I can write equations with letters standing for the unknown quantities.
4.OA.B.4	Determine if a whole number is a multiple of a given number	I can determine if a whole number is a multiple of a given number.
	Recognize that a whole number is a multiple of its factors	I can recognize that a whole number is a multiple of each of its factors.
	Find factor pairs	I can find factor pairs for whole numbers 1–100.
	Identify prime or composite numbers	I can determine whether a whole number (1–100) is prime or composite.
4.OA.C.5	Create a number or shape pattern	I can generate a number or shape pattern that follows a given rule.
	Identify features of patterns	I can identify features of the pattern.

Measurement *I Can...* Statements

STANDARD NUMBER	BULLETIN BOARD PHRASE(S)	I CAN STATEMENT(S)
4.MD.A.1	Know relative sizes of measurement units	I know relative sizes of measurement units within a system of units.
		I can express measurements in a larger unit in terms of a smaller unit.
	Record measurement equivalents in two-column tables	I can record measurement equivalents in a two-column table.
4.MD.A.2	Solve word problems involving measurement	I can use +, −, x, ÷ to solve word problems involving different units of measurement.
	Represent measurement quantities using diagrams	I can represent measurement quantities using diagrams.
4.MD.A.3	Apply the perimeter formula	I can apply the perimeter formula for rectangles to real-world and mathematical problems.
	Apply the area formula	I can apply the area formula for rectangles to real-world and mathematical problems.
4.MD.B.4	Create a line plot	I can make a line plot using fractions of a unit.
	Use and interpret data in line plots	I can use information in line plots to solve problems involving adding and subtracting fractions.
4.MD.C.5	Recognize angles	I can recognize that angles are geometric shapes formed when two rays share an endpoint.
4.MD.C.5a, 4.MD.C.5b	Read angle degrees	I can read the degree of an angle.
4.MD.C.5a, 4.MD.C.5b, 4.MD.C.6	Measure angles	I can understand how an angle in a circle is measured.
4.MD.C.6	Understand how to use a protractor	I can use a protractor to construct and measure angles.
4.MD.C.7	Recognize angle measure as additive	I can recognize that the sum of the angle parts is equal to the whole angle.
	Solve addition and subtraction problems to find unknown angles	I can solve addition and subtraction problems with unknown angles on a diagram.

COMMON CORE STATE STANDARDS

for Fourth Grade

Operations & Algebraic Thinking

USE THE FOUR OPERATIONS WITH WHOLE NUMBERS TO SOLVE PROBLEMS.

CCSS.Math.Content.4.OA.A.1
Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

CCSS.Math.Content.4.OA.A.2
Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.[1]

CCSS.Math.Content.4.OA.A.3
Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

GAIN FAMILIARITY WITH FACTORS AND MULTIPLES.

CCSS.Math.Content.4.OA.B.4
Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

GENERATE AND ANALYZE PATTERNS.

CCSS.Math.Content.4.OA.C.5
Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

1 Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

Number & Operations in Base Ten & Fractions[1]

GENERALIZE PLACE VALUE UNDERSTANDING FOR MULTI-DIGIT WHOLE NUMBERS.

CCSS.Math.Content.4.NBT.A.1
Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*

CCSS.Math.Content.4.NBT.A.2
Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

CCSS.Math.Content.4.NBT.A.3
Use place value understanding to round multi-digit whole numbers to any place.

USE PLACE VALUE UNDERSTANDING AND PROPERTIES OF OPERATIONS TO PERFORM MULTI-DIGIT ARITHMETIC.

CCSS.Math.Content.4.NBT.B.4
Fluently add and subtract multi-digit whole numbers using the standard algorithm.

CCSS.Math.Content.4.NBT.B.5
Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

CCSS.Math.Content.4.NBT.B.6
Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

EXTEND UNDERSTANDING OF FRACTION EQUIVALENCE AND ORDERING.

CCSS.Math.Content.4.NF.A.1
Explain why a fraction *a/b* is equivalent to a fraction *(n × a)/(n × b)* by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

CCSS.Math.Content.4.NF.A.2
Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

BUILD FRACTIONS FROM UNIT FRACTIONS.

CCSS.Math.Content.4.NF.B.3
Understand a fraction *a/b* with *a* > 1 as a sum of fractions 1/*b*.

- **CCSS.Math.Content.4.NF.B.3a**
  Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- **CCSS.Math.Content.4.NF.B.3b**
  Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*
- **CCSS.Math.Content.4.NF.B.3c**
  Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
- **CCSS.Math.Content.4.NF.B.3d**
  Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

CCSS.Math.Content.4.NF.B.4
Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

- **CCSS.Math.Content.4.NF.B.4a**
  Understand a fraction *a/b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*
- **CCSS.Math.Content.4.NF.B.4b**
  Understand a multiple of *a/b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*
- **CCSS.Math.Content.4.NF.B.4c**
  Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

UNDERSTAND DECIMAL NOTATION FOR FRACTIONS, AND COMPARE DECIMAL FRACTIONS.

CCSS.Math.Content.4.NF.C.5
Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.[2] *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

CCSS.Math.Content.4.NF.C.6
Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

CCSS.Math.Content.4.NF.C.7
Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

1 Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, 100.

2 Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.

Measurement & Data

SOLVE PROBLEMS INVOLVING MEASUREMENT AND CONVERSION OF MEASUREMENTS.

CCSS.Math.Content.4.MD.A.1
Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

CCSS.Math.Content.4.MD.A.2
Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

CCSS.Math.Content.4.MD.A.3
Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

REPRESENT AND INTERPRET DATA.

CCSS.Math.Content.4.MD.B.4
Make a line 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 line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

GEOMETRIC MEASUREMENT: UNDERSTAND CONCEPTS OF ANGLE AND MEASURE ANGLES.

CCSS.Math.Content.4.MD.C.5
Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

- **CCSS.Math.Content.4.MD.C.5a**
  An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.
- **CCSS.Math.Content.4.MD.C.5b**
  An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

CCSS.Math.Content.4.MD.C.6
Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

CCSS.Math.Content.4.MD.C.7
Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Geometry

DRAW AND IDENTIFY LINES AND ANGLES, AND CLASSIFY SHAPES BY PROPERTIES OF THEIR LINES AND ANGLES.

CCSS.Math.Content.4.G.A.1
Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

CCSS.Math.Content.4.G.A.2
Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

CCSS.Math.Content.4.G.A.3
Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.