Fourth Grade Mathematics

Description	The Appleton Area School District elementary mathematics program provides students opportunities to develop mathematical skills in thinking and applying problem-solving strategies. The framework of the program is based on providing students the knowledge of when and how to apply mathematical concepts and skills as well as an understanding of why the mathematical processes work.
Credits	
Prerequisites	
Textbooks/Resources	Fuson, Dr. Karen C. *Math Expressions Common Core: Student Activity Book, Volume 1 & 2.* Houghton Mifflin Harcourt, 2013. ISBN# 978-0-547-82475-8
Required Assessments	District-wide, standards-based assessments identified
Board Approved	April 1999
Revised	September 2009

AASD Mathematics Goals for K-12 Students

- *Become mathematical problem solvers.*
- *Learn to reason mathematically.*
- *Learn to communicate mathematically.*
- *Make mathematical connections.*
- *Develop conceptual understanding of mathematics.*
- *Develop procedural fluency.*
- *Learn to use technology appropriately.*

AASD Mathematics Standards for Students in Grade Four

Mathematical Practice Standards

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

Mathematics Content Standards

Domain	***Cluster***
I. Operations and Algebraic Thinking	A. Use the four operations with whole numbers to solve problems. B. Gain familiarity with factors and multiples. C. Generate and analyze patterns.
II. Number and Operations in Base Ten	A. Generalize place value understanding for multi-digit whole numbers. B. Use place value understanding and properties of operations to perform multi-digit arithmetic.
III. Number and Operations - Fractions	A. Extend understanding of fraction equivalence and ordering. B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. C. Understand decimal notation for fractions, and compare decimal fractions.
IV. Measurement and Data	A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. B. Represent and interpret data. C. Geometric measurement: understand concepts of angle and measure angles.
V. Geometry	A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Essential Learning Objectives	Performance Indicators	Classroom Assessments
1. Develop deep conceptual understanding of mathematics by engaging in age-appropriate mathematical habits.	**Performance will be satisfactory when the student:** a. makes Sense of problems and perseveres in solving them. b. reasons abstractly and quantitatively. c. constructs viable arguments and critiques the reasoning of others. d. models with mathematics. e. uses appropriate tools strategically. f. attends to precision. g. looks for and makes use of structure. h. looks for and expresses regularity in repeated reasoning.	
Objectives are linked to the Mathematical Practice Standards.		
2. Use the four operations with whole numbers to solve problems.	**Performance will be satisfactory when the student:** a. interprets 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. Represents verbal statements of multiplicative comparisons as multiplication equations. b. multiplies or divides 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. c. solves 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. Assesses the reasonableness of answers using mental computation and estimation strategies including rounding.	
Objectives are linked to the following AASD Mathematics Domains: I. Operations and Algebraic Thinking		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
3. Gain familiarity with factors and multiples.	**Performance will be satisfactory when the student:** a. finds all factor pairs for a whole number in the range 1–100. Recognizes that a whole number is a multiple of each of its factors. Determines whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determines whether a given whole number in the range 1–100 is prime or composite.	
Objectives are linked to the following AASD Mathematics Domains: I. Operations and Algebraic Thinking		
4. Generate and analyze patterns.	**Performance will be satisfactory when the student:** a. generates a number or shape pattern that follows a given rule. Identifies 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.*	
Objectives are linked to the following AASD Mathematics Domains: I. Operations and Algebraic Thinking		
5. Generalize place value understanding for multi-digit whole numbers.	**Performance will be satisfactory when the student:** a. recognizes 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.* b. reads and writes multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compares two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. c. uses place value understanding to round multi-digit whole numbers to any place.	
Objectives are linked to the following AASD Mathematics Domains: II. Number and Operations in Base Ten		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
6. Use place value understanding and properties of operations to perform multi-digit arithmetic.	**Performance will be satisfactory when the student:** a. fluently adds and subtracts multi-digit whole numbers using the standard algorithm. b. multiplies a whole number of up to four digits by a one-digit whole number, and multiplies two two-digit numbers, using strategies based on place value and the properties of operations. Illustrates and explains the calculation by using equations, rectangular arrays, and/or area models. c. finds 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. Illustrates and explain the calculation by using equations, rectangular arrays, and/or area models.	
Objectives are linked to the following AASD Mathematics Domains: II. Number and Operations in Base Ten		
7. Extend understanding of fraction equivalence and ordering.	**Performance will be satisfactory when the student:** a. explains why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ 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. Uses this principle to recognize and generate equivalent fractions. b. compares 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. Recognizes that comparisons are valid only when the two fractions refer to the same whole. Records the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.	
Objectives are linked to the following AASD Mathematics Domains: III. Number and Operations - Fractions		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
8. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	**Performance will be satisfactory when the student:** a. understands a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. 1. Understands addition and subtraction of fractions as joining and separating parts referring to the same whole. 2. Decomposes a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justifies 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.* 3. Adds and subtracts 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. 4. Solves 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. b. applies and extends previous understandings of multiplication to multiply a fraction by a whole number. 1. Understands 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).* 2. Understands a multiple of *a/b* as a multiple of 1/*b*, and uses 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.)*	

Essential Learning Objectives	Performance Indicators	Classroom Assessments
8b (Continued)	3. Solves 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?*	
Objectives are linked to the following AASD Mathematics Domains: III. Number and Operations - Fractions		
9. Understand decimal notation for fractions, and compare decimal fractions.	**Performance will be satisfactory when the student:** a. expresses a fraction with denominator 10 as an equivalent fraction with denominator 100, and uses this technique to add two fractions with respective denominators 10 and 100*. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* b. uses 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.* c. compares two decimals to hundredths by reasoning about their size. Recognizes that comparisons are valid only when the two decimals refer to the same whole. Records the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.	
Objectives are linked to the following AASD Mathematics Domains: III. Number and Operations - Fractions		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
10. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	**Performance will be satisfactory when the student:** a. knows 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, expresses measurements in a larger unit in terms of a smaller unit. Records 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), ...* b. uses 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. Represents measurement quantities using diagrams such as number line diagrams that feature a measurement scale. c. applies 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*.	
Objectives are linked to the following AASD Mathematics Domains: IV. Measurement and Data		
11. Represent and interpret data.	**Performance will be satisfactory when the student:** a. makes a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solves 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.*	
Objectives are linked to the following AASD Mathematics Domains: IV. Measurement and Data		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
12. Geometric measurement: understand concepts of angle and measure angles.	**Performance will be satisfactory when the student:** a. recognizes angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: 1. 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. 2. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. b. measures angles in whole-number degrees using a protractor. Sketchs angles of specified measure. c. recognizes 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. Solves 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.	
Objectives are linked to the following AASD Mathematics Domains: IV. Measurement and Data		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
13. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	**Performance will be satisfactory when the student:** a. draws points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. b. classifies 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. Recognizes right triangles as a category, and identifies right triangles. c. recognizes 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. Identifies line-symmetric figures and draws lines of symmetry.	
Objectives are linked to the following AASD Mathematics Domains: V. Geometry		

Resources and learning activities that address course objectives: