Fifth 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# 978-0-547-82476-5

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 Five

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. Write and interpret numerical expressions. B. Analyze patterns and relationships.
II. Number and Operations in Base Ten	A. Understand the place value system. B. Perform operations with multi-digit whole numbers and with decimals to hundredths.
III. Number and Operations - Fractions	A. Use equivalent fractions as a strategy to add and subtract fractions. B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
IV. Measurement and Data	A. Convert like measurement units within a given measurement system. B. Represent and interpret data. C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.
V. Geometry	A. Graph points on the coordinate plane to solve real-world and mathematical problems. B. Classify two-dimensional figures into categories based on their properties.

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. Write and interpret numerical expressions.	**Performance will be satisfactory when the student:** a. uses parentheses, brackets, or braces in numerical expressions, and evaluates expressions with these symbols. b. writes simple expressions that record calculations with numbers, and interprets numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*	
Objectives are linked to the following AASD Mathematics Domains: I. Operations and Algebraic Thinking		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
3. Analyze patterns and relationships.	**Performance will be satisfactory when the student:** a. generates two numerical patterns using two given rules. Identifies apparent relationships between corresponding terms. Forms ordered pairs consisting of corresponding terms from the two patterns, and graphs the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*	
Objectives are linked to the following AASD Mathematics Domains: I. Operations and Algebraic Thinking		
4. Understand the place value system.	**Performance will be satisfactory when the student:** a. recognizes that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. b. explains patterns in the number of zeros of the product when multiplying a number by powers of 10, and explains patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Uses whole-number exponents to denote powers of 10. c. reads, writes, and compares decimals to thousandths. 1. Reads and writes decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$. 2. Compares two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. d. uses place value understanding to round decimals 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
5. Perform operations with multi-digit whole numbers and with decimals to hundredths.	**Performance will be satisfactory when the student:** a. fluently multiplies multi-digit whole numbers using the standard algorithm. b. finds whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrates and explains the calculation by using equations, rectangular arrays, and/or area models. c. adds, subtracts, multiplies, and divides decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relates the strategy to a written method and explains the reasoning used.	
Objectives are linked to the following AASD Mathematics Domains: II. Number and Operations in Base Ten		
6. Use equivalent fractions as a strategy to add and subtract fractions.	**Performance will be satisfactory when the student:** *a.* addd and subtracts fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)* b. solves word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Uses benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*	
Objectives are linked to the following AASD Mathematics Domains: III. Number and Operations - Fractions		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
7. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	**Performance will be satisfactory when the student:** a. interprets a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solves word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?* b. applies and extends previous understandings of multiplication to multiply a fraction or whole number by a fraction. 1. Interprets the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)* 2. Finds the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and shows that the area is the same as would be found by multiplying the side lengths. Multiplies fractional side lengths to find areas of rectangles, and represents fraction products as rectangular areas. c. interprets multiplication as scaling (resizing), by: 1. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. 2. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication	

7. Continued	by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. d. solves real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. e. applies and extends previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. 1. Interprets division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* 2. Interprets division of a whole number by a unit fraction, and computes such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* 3. Solves real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*	

Objectives are linked to the following AASD Mathematics Domains:
III. Number and Operations - Fractions

Essential Learning Objectives	Performance Indicators	Classroom Assessments
8. Convert like measurement units within a given measurement system.	**Performance will be satisfactory when the student:** a. converts among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and uses these conversions in solving multi-step, real world problems.	
Objectives are linked to the following AASD Mathematics Domains: IV. Measurement and Data		
9. 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). Uses operations on fractions for this grade to solve problems involving information presented in line 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.*	
Objectives are linked to the following AASD Mathematics Domains: IV. Measurement and Data		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
10. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	**Performance will be satisfactory when the student:** a. recognizes volume as an attribute of solid figures and understands concepts of volume measurement. 1. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. 2. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. b. measures volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. c. relates volume to the operations of multiplication and addition and solves real world and mathematical problems involving volume. 1. Finds the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and shows that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represents threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. 2. Applies the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. 3. Recognizes volume as additive. Finds volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.	
Objectives are linked to the following AASD Mathematics Domains: IV. Measurement and Data		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
11. Graph points on the coordinate plane to solve real-world and mathematical problems.	**Performance will be satisfactory when the student:** a. uses a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understands that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). b. represents real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interprets coordinate values of points in the context of the situation.	
Objectives are linked to the following AASD Mathematics Domains: V. Geometry		
12. Classify two-dimensional figures into categories based on their properties.	**Performance will be satisfactory when the student:** a. understands that attributes belonging to a category of two-dimensional figures also belongs to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.* b. classifies two-dimensional figures in a hierarchy based on properties.	
Objectives are linked to the following AASD Mathematics Domains: V. Geometry		

Resources and learning activities that address course objectives: