

### **Third Grade Mathematics**

#### **A - Operations and Algebraic Thinking**

- 1) interpret products of whole numbers using repeated addition, array models and counting by multiples (skip counting) to correctly multiply one digit numbers
- 2) interpret whole number quotients of whole numbers to describe in context the two models of division: determining how many equal parts of a given size or amount may be taken away from the whole (repeated subtraction) and determining the size of the parts when the whole is separated into a given number of equal parts (sharing model)
- 3) apply multiplication and division (products or dividends 0 - 100) to solve word problems in situations involving equal groups, arrays and measurement quantities
- 4) use a symbol to represent an unknown and determine the value of the unknown in a multiplication or division equation relating three whole numbers
- 5) apply commutative, associative, and distributive properties as strategies to multiply and divide
- 6) explain the relationship between multiplication and division to understand division as an unknown-factor problem
- 7) multiply and divide fluently (using products and dividends 0 - 100) using strategies such as the relationship between multiplication and division or properties of operations
- 8) assess the reasonableness of answers using mental computation and estimation strategies, including rounding
- 9) solve and represent two-step word problems using the four operations, and represent with a letter standing for the unknown quantity
- 10) describe and extend arithmetic patterns that may also occur in a table or graph (including patterns in the addition table and multiplication table)
- 11) explain patterns using properties of operations

#### **B - Number and Operations in Base Ten**

- 12) use place value understanding to round whole numbers to the nearest 10 or 100
- 13) add and subtract fluently within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction
- 14) model and explain the effect on the product when multiplying by multiples of 10 (in the range of 10-90) using strategies based on place value and properties of operations

#### **C - Number and Operations: Fractions**

- 15) model and explain that the fraction  $\frac{a}{b}$  represents a equal sized parts of  $\frac{1}{b}$  when a whole is divided into b equal sized parts
- 16) model and explain that a fraction  $\frac{1}{b}$  is the quantity formed by 1 part when a whole is partitioned into b equal parts
- 17) represent a fraction  $\frac{1}{b}$  on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts and recognize that each part has size  $\frac{1}{b}$  and that the endpoint of the part based at 0 locates the number  $\frac{1}{b}$  on the number line
- 18) represent a fraction  $\frac{a}{b}$  on a number line diagram by marking off "a" lengths  $\frac{1}{b}$  from 0 and recognize that the resulting interval has size  $\frac{a}{b}$  and that its endpoint locates the number  $\frac{a}{b}$  on the number line
- 19) identify, represent, and generate simple equivalent fractions; justify equivalence using visual models such as the same point on a number line
- 20) compare two fractions with the same numerator or denominator using models and reasoning about their size, and recognize that the comparisons are valid only when the two fractions refer to the same whole
- 21) model and express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers

#### **D - Measurement and Data**

- 22) determine elapsed time by solving word problems involving addition and subtraction of time intervals in minutes
- 23) tell and write time to the nearest minute

## Proposed Mathematics AKS for 2012-2013

### **D - Measurement and Data (*continued*)**

- 24) estimate and measure liquid volumes and masses of objects to include the metric units grams, kilograms, liters and the customary units ounces, cups, pints, quarts, and gallons
- 25) add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units
- 26) solve one- and two-step word problems by analyzing information presented in a created scaled pictograph or bar graph
- 27) generate measurement data by measuring lengths to the nearest quarter inch, half inch and millimeter in addition to the previously learned inch, foot, yard, centimeter and meter
- 28) create line plots showing measurement data where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters
- 29) use words, pictures and/or numbers to show that "unit square" is a square with a side length of 1 unit, has an area of one square unit, and can be used to measure area of plane figures
- 30) demonstrate that a plane figure which can be covered without gaps or overlaps by "n" unit squares is said to have an area of "n" square units
- 31) measure areas using unit squares by counting, adding, tiling and multiplying with models in square cm, square m, square in. and square ft.
- 32) find the area of a rectilinear figure by dividing it into non-overlapping rectangles and finding the sum of the areas of those parts
- 33) relate area to the operations of multiplication and addition
- 34) solve real world problems involving the perimeters of polygons including finding the perimeter given the side lengths and finding an unknown side length

### **E - Geometry**

- 35) identify, draw, examine, and classify quadrilaterals (including rhombuses, rectangles, squares, parallelograms, and trapezoids)
- 36) compare and contrast the attributes of quadrilaterals, and categorize quadrilaterals based on shared attributes
- 37) partition shapes into parts with equal areas and express the area of each part as a unit fraction of the whole.

### **TA - Operations and Algebraic Thinking**

- 38) determine the unknown whole number in an addition or subtraction equation relating to three whole numbers by using symbols

### **TD - Measurement and Data**

- 39) create a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories

## **Fourth Grade Mathematics**

### **A - Operations and Algebraic Thinking**

- 1) explain a multiplication equation as a comparison and represent verbal statements of multiplicative comparisons as multiplication equations
- 2) solve multiplication and division word problems involving multiplicative comparison using drawings and equations
- 3) solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted and with a letter standing for the unknown quantity
- 4) determine the reasonableness of answers using mental computation and estimation strategies, including rounding, when using the four operations
- 5) explain the different meanings of the remainder in division problems
- 6) determine multiples and factors for whole numbers 1-100
- 7) determine whether a given whole number in the range 1-100 is prime or composite
- 8) investigate, represent, and generate number or shape patterns to describe given rules and solve problems
- 9) identify apparent features of a number or shape pattern that were not explicit in the rule itself

### **B - Number and Operations in Base Ten**

- 10) explain that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right
- 11) read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form for places from hundredths through millions
- 12) compare two multi-digit numbers based on meanings of the digits in each place, using  $>$ ,  $=$ , and  $<$  symbols to record the results for comparisons
- 13) use place value understanding to round whole numbers to any place using tools such as a number line and/or charts
- 14) add and subtract multi-digit whole numbers fluently using the standard algorithm
- 15) illustrate and explain multiplication calculations by using equations, rectangular arrays, and/or area models
- 16) 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
- 17) illustrate and explain division calculations by using equations, rectangular arrays, and/or area models
- 18) calculate 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

### **C - Number and Operations: Fractions**

- 19) recognize and generate simple equivalent fractions
- 20) explain 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
- 21) compare two fractions with different numerators and different denominators by creating common denominators or numerators, or by comparing to a benchmark fraction such as  $1/2$
- 22) use the symbols  $>$ ,  $=$ , or  $<$  to compare fractions and justify the conclusions by using a visual fraction model
- 23) add and subtract mixed numbers with like denominators by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction
- 24) model and explain addition and subtraction of fractions with like denominators as joining and separating parts referring to the same whole
- 25) solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem
- 26) model and explain that a fraction  $a/b$  with  $a > 1$  is a sum of fractions  $1/b$

## Proposed Mathematics AKS for 2012-2013

### **C - Number and Operations: Fractions (*continued*)**

- 27) model fraction  $a/b$  as a multiple of  $1/b$  and apply this to multiplying a fraction by a whole number
- 28) solve word problems involving multiplication of a fraction by a whole number
- 29) 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
- 30) model and explain that a one place decimal fraction represents tenths (e.g.  $0.3 = 3/10$ ) and a two place decimal fraction represents hundredths (e.g.  $0.75 = 75/100$ )
- 31) read, write, order, and compare place value of decimals to hundredths, using  $<$ ,  $>$ , or  $=$ , by reasoning about their size and justify the conclusions using a visual model

### **D - Measurement**

- 32) compare one unit to another within a single system of linear measurement and record measurement equivalents in a two-column table, including km, m, cm, yd, ft, in.
- 33) compare one unit to another within a single system of capacity measurement and record measurement equivalents in a two-column table, including l, ml, c, pt, qt, gal
- 34) compare one unit to another within a single system of weight measurement and record measurement equivalents in a two-column table, including g, kg, lb, oz.

### **E - Geometry**

- 35) solve word problems by applying the four operations to problems involving whole number, decimal and fractional distances, intervals of time, liquid volumes, masses of objects, and money
- 36) represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale
- 37) apply the area and perimeter formulas for rectangles in real world and mathematical problems
- 38) solve problems involving addition and subtraction of fractions by using information presented in line plots

### **F - Measurement and Data**

- 39) create line plots to display a data set of measurements in fractions of a unit ( $1/2$ ,  $1/4$ ,  $1/8$ )

### **G - Geometry**

- 40) recognize angles as geometric shapes that are formed wherever two rays share a common endpoint and understand concepts of angle measurement
- 41) measure angles by understanding an angle that turns through  $1/360$  of a circle is called a "one-degree angle," and an angle that turns through  $n$  one-degree angles is said to have an angle measure of  $n$  degrees
- 42) measure and draw angles using tools such as a protractor or angle ruler
- 43) model and explain 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
- 44) solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems by using an equation with a symbol for the unknown angle measure
- 45) draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines and identify these in two-dimensional figures
- 46) examine and compare angles in order to classify and identify two-dimensional figures by their angles to include right triangles
- 47) classify two-dimensional figures based on the presence or absence of parallel or perpendicular line segments, or the presence or absence of angles of a specified size
- 48) identify and draw lines of symmetry for two-dimensional figures

### **TG - Geometry**

- 49) estimate and measure liquid volumes and masses of objects to include the metric units grams, kilograms, liters and the customary units ounces, cups, pints, quarts and gallons

## Proposed Mathematics AKS for 2012-2013

### **TG – Geometry (*continued*)**

- 50) find the area of a rectilinear figure by dividing it into non-overlapping rectangles and finding the sum of the areas of those parts
- 51) identify, draw, examine, and classify quadrilaterals (including rhombuses, rectangles, squares, parallelograms, and trapezoids)
- 52) compare and contrast the attributes of quadrilaterals, and categorize quadrilaterals based on shared attributes

### **TH - Numbers and Operations**

- 53) use place value understanding to round whole numbers to the nearest 10 or 100
- 54) identify, represent, and generate simple equivalent fractions; justify equivalence using visual models such as the same point on a number line
- 55) compare two fractions with the same numerator or denominator using models and reasoning about their size, and recognize that the comparisons are valid only when the two fractions refer to the same whole

## **Fifth Grade Mathematics**

### **A - Operations and Algebraic Thinking**

- 1) use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols
- 2) compute using the order of operations, including parentheses, to write and evaluate simple expressions that record calculations with numbers
- 3) interpret numerical expressions without evaluating them
- 4) form and graph ordered pairs of corresponding terms for numerical patterns
- 5) generate two numerical patterns using two given rules and identify apparent relationships between corresponding terms

### **B - Number and Operations in Base Ten**

- 6) recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and  $1/10$  of what it represents in the place to its left
- 7) use whole number exponents to denote powers of 10
- 8) analyze the effect on the product when a number is multiplied by 10, 100, 1000, 0.1, and 0.01
- 9) read, write, order, and compare place value of decimals to thousandths using base ten numerals, number names, and expanded form
- 10) round decimals to any place using tools such as a number line and/or charts
- 11) multiply multi-digit whole numbers fluently using the standard algorithm
- 12) solve problems involving division of up to 4 digit whole number dividends by a one or two digit whole number divisor using strategies based on place value, properties and/or relationship between multiplication and division, including problems that generate a remainder
- 13) illustrate and explain division calculations by using equations, rectangular arrays, and/or area models
- 14) add, subtract, multiply, and divide 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
- 15) relate decimal operation strategies to a written method and explain the reasoning used

### **C - Number and Operations: Fractions**

- 16) add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators
- 17) use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers
- 18) solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators
- 19) use words, pictures, and/or numbers to show that division of whole numbers can be represented as a fraction ( $a/b = a \div b$ )
- 20) solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers
- 21) apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction
- 22) find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths
- 23) relate the principle of fraction equivalence,  $a/b = (nxa)/(nxb)$ , to the effect of multiplying  $a/b$  by 1
- 24) interpret multiplication as scaling by comparing the size of the product to the sizes of the factors without multiplying
- 25) explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and why multiplying a given number by a fraction less than 1 results in a product smaller than the given number
- 26) solve real world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem

## Proposed Mathematics AKS for 2012-2013

### **C - Number and Operations: Fractions (continued)**

- 27) interpret division of a unit fraction by a non-zero whole number and compute such quotients
- 28) solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions
- 29) apply and extend previous understanding of division to divide unit fractions by whole numbers and whole numbers by unit fractions
- 30) interpret division of a whole number by a unit fraction and compute such quotients

### **D - Measurement and Data**

- 31) convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step, real world problems
- 32) make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ) and solve problems using the line plot data
- 33) use words, pictures, or numbers to show a cubic unit is represented by a cube in which each edge has a length of one unit
- 34) apply concepts of volume measurement to explain volume as an attribute of solid figures packed without gaps or overlaps using  $n$  unit cubes
- 35) measure volume as cubic centimeters, cubic meters, cubic inches, cubic feet, and cubic yards
- 36) estimate, derive and apply the formula ( $V = l \times w \times h$  and  $V = b \times h$ ) for the volume of a cube and a rectangular prism using manipulatives and relate volume to the operations of multiplication and addition to solve real world and mathematical problems
- 37) recognize and calculate volume as additive when 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

### **E - Geometry**

- 38) create, label, and use a coordinate grid system
- 39) represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation
- 40) demonstrate that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category
- 41) classify two-dimensional figures in a hierarchy based on properties

### **TA - Operations and Algebraic Thinking**

- 42) determine multiples and factors for whole numbers 1-100
- 43) determine whether a given whole number in the range 1-100 is prime or composite

### **TC - Number and Operations: Fractions**

- 44) use the symbols  $>$ ,  $=$ , or  $<$  to compare fractions and justify the conclusions by using a visual fraction model
- 45) model fraction  $\frac{a}{b}$  as a multiple of  $\frac{1}{b}$  and apply this to multiplying a fraction by a whole number

### **TD - Measurement and Data**

- 46) compare one unit to another within a single system of capacity measurement and record measurement equivalents in a two-column table, including l, ml, c, pt, qt, gal
- 47) find the area of a rectilinear figure by dividing it into non-overlapping rectangles and finding the sum of the areas of those parts