RICAS Supplemental Assessment Tables and Achievement Level Descriptors

Grade 4 Mathematics

This document is designed to provide educators with assessment information for specific standards on RICAS and to describe the RICAS achievement levels for mathematics.

The first set of tables are the Supplemental Assessment Tables. These tables include additional examples or interpretations of how a standard may be assessed, explicit references to the footnotes in the CCSS, and definitions of relevant terms not included in the CCSS glossary. Examples within individual standards are highlighted in blue.

The four RICAS achievement levels are detailed later in the document. The accompanying tables provide summaries of the knowledge and skills demonstrated on RICAS for the domains of the grade as well as conceptual understanding and procedural knowledge, problem solving, mathematical reasoning, and mathematical communication.

	RICAS Grade 4 Supplemental Asses	sment Information Chart	
CCSS Standard Key	Standard Text	Supplemental Assessment Information	
4.0A.1	Interpret a multiplication equation as a comparison, e.g., interpret $35=5 \times 7$ 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.		
4.OA.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.	Refer to Glossary, <u>Table 2</u> for problem types.	
4.OA.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.	Students should know multiplication facts and related division facts through 12 x 12.	
4.OA.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 .	 Prime numbers are whole numbers greater than 1 whose only factors are 1 and itself. Composite numbers are whole numbers that have more than two factors. The number 1 is neither prime nor composite. 	
4.OA.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.		

	RICAS Grade 4 Supplemental Assessment Information Chart				
CCSS Standard Key	Standard Text Supplemental Assessment Information				
4.NBT.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 $700 \div 70 = 10$ by applying concepts of place value and division.	 Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000. Students are expected to recognize this pattern for any digit in a multi-digit number. 			
4.NBT.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.	Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.			
4.NBT.3	Use place value understanding to round multi-digit whole numbers to any place.	Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.			
4.NBT.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.	Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.			
4.NBT.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.	Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.			
4.NBT.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.	Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.			
4.NF.1	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. Use this principle to recognize and generate equivalent fractions.	 Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. This standard includes fractions greater than 1. 			



RICAS Grade 4 Supplemental Assessment Information Chart				
CCSS Standard Key	Standard Text	Supplemental Assessment Information		
4.NF.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.	 Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. A benchmark fraction is a common fraction against which other fractions can be measured, such as ½. 		
4.NF.3a	Understand a fraction <i>a/b</i> with <i>a</i> > 1 as a sum of fractions 1/ <i>b</i> . Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.	 The whole can be a set of objects. Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. 		
4.NF3b	Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. 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. <i>Examples:</i> $3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8$.	 Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. Drawings may also be used to justify a decomposition. 		
4.NF.3c	Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. 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.	Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.		
4.NF.3d	Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$. 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.	 Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. Drawings may also be used to represent the problem. 		

RICAS Grade 4 Supplemental Assessment Information Chart			
CCSS Standard Key	Standard Text	Supplemental Assessment Information	
4.NF.4a	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. 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 $5 \times (1/4)$, recording the conclusion by the equation $5/4 = 5 \times (1/4)$.	Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.	
4.NF.4b	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. 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 $3 \times (2/5)$ as $6 \times (1/5)$, recognizing this product as $6/5$. (In general, $n \times (a/b) = (n \times a)/b$.)	Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.	
4.NF.4c	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. 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?	Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.	

RICAS Grade 4 Supplemental Assessment Information Chart			
CCSS Standard Key	SS Standard Key Standard Text Supplemental Assessment Informatic		
4.NF.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. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.	 A fraction in which the denominator is a power of ten, usually expressed by the use of the decimal point, is a decimal fraction (as 0.25 = 25/100 or 0.025 = 25/1000 or a mixed number as 3.025 = 3 25/1000). 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. Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. 	
4.NF.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.	 A fraction in which the denominator is a power of ten, usually expressed by the use of the decimal point, is a decimal fraction (as 0.25 = 25/100 or 0.025 = 25/1000 or a mixed number as 3.025 = 3 25/1000). Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. 	
4.NF.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.	 A fraction in which the denominator is a power of ten, usually expressed by the use of the decimal point, is a decimal fraction (as 0.25 = 25/100 or 0.025 = 25/1000 or a mixed number as 3.025 = 3 25/1000). Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. 	

RICAS Grade 4 Supplemental Assessment Information Chart			
CCSS Standard Key	Standard Text	Supplemental Assessment Information	
4.MD.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),		
4.MD.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.		
4.MD.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems. <i>For example, find the</i> <i>width of a rectangular room given the area of the flooring</i> <i>and the length, by viewing the area formula as a</i> <i>multiplication equation with an unknown factor.</i>	 When finding areas of rectangular regions answers will be in square units. For example, the area of a 1 cm x 1 cm rectangular region will be 1 square centimeter (Students are not expected to use the notation 1 cm².) When finding the perimeter of a rectangular region answers will be in linear units. For example, the perimeter of the region is: 1cm + 1cm + 1cm + 1cm = 4 cm or 2(1cm) + 2(1cm) = 4 cm. 	

RICAS Grade 4 Supplemental Assessment Information Chart			
CCSS Standard Key	Standard Text	Supplemental Assessment Information	
4.MD.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.	The term dot plot is interchangeable with line plot.	
4.MD.5a	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: 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.		
4.MD.5b	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: An angle that turns through <i>n</i> one-degree angles is said to have an angle measure of <i>n</i> degrees.		
4.MD.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.		
4.MD.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.		

RICAS Grade 4 Supplemental Assessment Information Chart				
CCSS Standard Key	Key Standard Text Supplemental Assessment Information			
4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.			
4.G.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.			
4.G.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.			

Grade 4 RICAS Achievement Level Descriptors

Student results on the RICAS assessments are reported according to four achievement levels:

• Exceeding Expectations

A student who performed at this level exceeded grade-level expectations by demonstrating mastery of the subject matter.

• Meeting Expectations

A student who performed at this level met grade-level expectations and is academically on-track to succeed in the current grade in this subject.

• Partially Meeting Expectations

A student who performed at this level partially met grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should consider whether the student needs additional academic assistance to succeed in this subject.

• Not Meeting Expectations

A student who performed at this level did not meet grade-level expectations in this subject. The school, in consultation with the student's parent/guardian, should determine the coordinated academic assistance and/or additional instruction the student needs to succeed in this subject.

The descriptors included in the table below illustrate the knowledge and skills students demonstrate on RICAS at each level. Knowledge and skills are cumulative at each level. No descriptors are provided for the *Not Meeting Expectations* achievement level because students' work at this level, by definition, does not meet the criteria of the *Partially Meeting Expectations* level.

Grade 4 RICAS Achievement Level Descriptors			
Grade 4	Partially Meets Expectations On RICAS, a student at this level:	Meeting Expectations On RICAS, a student at this level:	Exceeding Expectations On RICAS, a student at this level:
Conceptual Understanding and Procedural Knowledge	 Demonstrates partial understanding of the grade appropriate numeration system Performs some calculations and estimations Identifies examples of basic math facts or mathematical concepts Mostly reads and sometimes constructs graphs, tables and charts 	 Applies understanding of the baseten system and fractions to interpret numbers and solve problems Performs most calculations and estimations Describes mathematical concepts and generates examples and counterexamples of concepts Represents data and mathematical relationships using equations, verbal descriptions, tables, and graphs 	 Performs complex calculations and estimations Selects the best representations for a given set of data Explains relationships between models such as equations, verbal descriptions, tables, and graphs Applies math facts and connects mathematical concepts from various areas of mathematics, and uses the concepts to develop generalizations Recognizes and makes use of structure, discerning patterns by seeing complicated things as single objects
Problem Solving	 Applies learned procedures to solve routine problems Uses concrete objects or pictures to help conceptualize and solve problems. 	 Applies learned procedures and mathematical concepts to solve a variety of problems, including multi- step problems Solves problems using multiple methods Demonstrates the relationships between operations used to solve problems and the context of the problems 	 Generates strategies and procedures to solve non-routine problems Solves problems using multiple methods, evaluating reasonableness of intermediate steps leading to the standard algorithms Draws connections between strategies Analyzes givens, constraints, and relationships in problems, using multiple methods and appropriate tools

Grade 4 RICAS Achievement Level Descriptors			
Grade 4	Partially Meets Expectations	Meeting Expectations	Exceeding Expectations
	On RICAS, a student at this level:	On RICAS, a student at this level:	On RICAS, a student at this level:
Mathematical Reasoning	 Applies some reasoning methods to solve routine problems 	 Uses a variety of reasoning methods to solve routine and non-routine problems Uses symbols to solve routine mathematical problems 	 Reasons abstractly and quantitatively, using multiple reasoning methods to solve complex problems and provides justification for the reasoning Decontextualizes situations and represents them symbolically
Mathematical Communication	 Identifies and uses basic terms 	 Uses logical forms of representation (e.g., text, graphs, symbols) to illustrate steps to a solution 	 Uses logical forms of representation (e.g., text, graphs, symbols) to justify solutions and solution strategies Constructs viable arguments and critiques the reasoning of others, attending to precision
Operations and Algebraic Thinking	 Interprets a multiplication equation as a comparison Solves multiplication and division word problems Solves two-step word problems using the four operations with whole numbers, including problems where remainders must be interpreted Identifies multiplication facts through 12 x 12 Identifies factor pairs in the 1-100 range Identifies a pattern that follows a rule 	 Recognizes verbal statements of multiplicative comparisons as multiplication equations. Represents multiplication and division word problems using drawings and equations Uses the four operations to solve multi-step word problems and represents the problems by equations Identifies related multiplication and division facts through 12 x 12 Finds factor pairs in the 1-100 range and recognizes that a whole number is a multiple of each of its factors Distinguishes between prime and composite numbers in the range 1-100 Identifies a pattern that follows a rule and, generates a pattern, given a rule 	 Explains the difference between multiplicative and additive comparison Uses equations to represent problems, and justifies solutions with estimation Identifies multiples and their corresponding factors, and distinguishes between prime and composite numbers. Generates patterns not explicit to the rule

Grade 4 RICAS Achievement Level Descriptors			
Grade 4	Partially Meets Expectations	Meeting Expectations	Exceeding Expectations
Number and Operations in Base Ten	 On RICAS, a student at this level: Reads and writes whole numbers using base-ten number names and expanded form Uses place value understanding to round whole numbers to the thousands place Solves problems involving multiplication of four-digit numbers by one-digit numbers Solves problems involving quotients and remainders with up to three-digit dividends and one-digit divisors based on place value and properties of operations 	 On RICAS, a student at this level: Uses place value to recognize that in a multi-digit number, a digit in any place represents 10 times as much as it represents in the place to its right Compares two multi-digit numbers based on place value position using <, > and = Uses place value understanding to round whole numbers to the ten thousands place Adds and subtracts whole numbers using the standard algorithm Solves problems involving multiplication of two-digit numbers by two-digit numbers Solves problems involving quotients and remainders with up to four-digit dividends and one-digit divisors, using the relationship between multiplication and division 	 On RICAS, a student at this level: Uses place value understanding to round whole numbers up to one million Uses understanding of structure to explain the standard algorithm for addition and subtraction. Solves problems involving multiplication of four-digit numbers by one-digit numbers, and justifies solutions by using equations, rectangular arrays or area models.
Number and Operations – Fractions	 Recognizes equivalency in fractions Compares fractions with different numerators and different denominators by using common denominators or common numerators 	 Explains why fractions are equivalent using visual fraction models Consistently compares two fractions when the two fractions refer to the same whole Compares fractions with different numerators and different 	 Generates equivalent fractions including fractions greater than 1 Decomposes fractions into a sum of fractions and justifies solutions to problems with visual fraction models and equations Justifies the conversion of a fraction with denominator of 10 to an

Number and Operations - Fractions	 Decomposes fractions into a sum of fractions and uses visual fraction models to solve problems Multiplies a fraction by a whole number 	 denominators by comparing to a benchmark fraction Adds and subtracts fractions with like denominators Decomposes fractions into a sum of fractions and uses equations to solve problems Adds and subtracts mixed numbers with like denominators by replacing with equivalent fraction and by using properties of operations or the relationship of addition and subtraction Uses visual fraction models and equations to solve word problems involving multiplication of a fraction by a whole number Uses decimal notation to represent fractions with denominators of 10 or 100 Consistently compares two decimals to hundredths when the two decimals refer to the same whole using <, > and = 	equivalent fraction with a denominator of 100 and expresses it as a decimal • Justifies the comparisons of two decimals to hundredths by using a visual model
Measurement and Data	 Solves measurement problems involving whole numbers using all four operations Solves measurement problems involving perimeter and area Interprets data presented in line plots (dot plots) and uses addition and subtraction of fractions to solve problems involving line plots 	 Solves problems involving converting measurements from larger units to smaller units Justifies solutions to perimeter and area problems Creates line plots (dot plots) in fractions of a unit (½, ¼, ½), to display given data, and uses addition and subtraction of fractions to solve problems involving line plots 	 Reasons about relative sizes of measurement units within one system of units Sketches an angles of specified measures, without a protractor



Grade 4 RICAS Achievement Level Descriptors			
Grade 4	Partially Meets Expectations	Meeting Expectations	Exceeding Expectations
	On RICAS, a student at this level:	On RICAS, a student at this level:	On RICAS, a student at this level:
Measurement	 Identifies concepts of angles and	 Uses a protractor to measure ,	
and Data	angle measurement	sketch or interpret an angle Finds unknown angles in diagrams	
Geometry	 Identifies right triangles, points, lines, line segments, rays, angles, perpendicular and parallel lines, and lines of symmetry 	 Identifies right triangles, draws points, lines, line segments, rays, angles, and perpendicular and parallel lines, and identifies these in two dimensional shapes Classifies two-dimensional shapes based on their attributes, including the presence and absence of parallel or perpendicular lines or angles of a specified size. Recognizes lines of symmetry in two-dimensional figures and identifies line-symmetric figures 	 Draws two-dimensional shapes based on attributes.