

RICAS Supplemental Assessment Tables and Achievement Level Descriptors

Grade 5 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 5 Supplemental Assessment Information Chart

CCSS Standard Key	Standard Text	Supplemental Assessment Information
5.OA.1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols	A sample expression is $(6 \times 30) + (6 \times 1/2)$.
5.OA.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. <i>For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.</i>	
5.OA.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane . <i>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.</i>	The coordinate plane is a plane in which a point is represented using two coordinates that determine the precise location of the point. Two perpendicular number lines are used to determine the locations of points.
5.NBT.1	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.	<ul style="list-style-type: none"> • Multi-digit decimal numbers are included in this standard. • Students are expected to recognize this pattern for any digit in a multi-digit number.
5.NBT.2	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	
5.NBT.3a	Read, write, and compare decimals to thousandths. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.	

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CCSS Standard Key	Standard Text	Supplemental Assessment Information
5.NBT.3b	Read, write, and compare decimals to thousandths. Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.	
5. NBT.4	Use place value understanding to round decimals to any place.	
5.NBT.5	Fluently multiply multi-digit whole numbers using the standard algorithm.	Include 2 digit x 4 digit numbers and 3 digit x 3 digit numbers.
5.NBT.6	Find 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. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	
5.NBT.7	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; relate the strategy to a written method and explain the reasoning used.	Strategies should also include the relationship between multiplication and division.
5. NF.1	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. <i>For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. (In general, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$.)</i>	

RICAS Grade 5 Supplemental Assessment Information Chart

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5.NF.2	Solve 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. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. <i>For example, recognize an incorrect result $2/5 + 1/2 = 3/7$, by observing that $3/7 < 1/2$.</i>	The whole can be a set of objects.
5.NF.3	Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve 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. <i>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?</i>	
5.NF.4a	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. Interpret 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 $a \times q \div b$. <i>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, $(a/b) \times (c/d) = (ac)/(bd)$.</i>	Area models may also be used.

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5.NF.4b	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. 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. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.	
5.NF.5a	Interpret multiplication as scaling (resizing), by: 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.	For example, which number is greater without multiplying: 225 or $\frac{3}{4} \times 225$; $11/50$ or $3/2 \times 11/50$?
5.NF.5b	Interpret multiplication as scaling (resizing), by: Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication 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.	
5.NF.6	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	
5.NF.7a	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. <i>For example, create a story context for $(1/3) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1/3) \div 4 = 1/12$ because $(1/12) \times 4 = 1/3$.</i>	Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.

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5.NF.7b	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Interpret division of a whole number by a unit fraction, and compute such quotients. <i>For example, create a story context for $4 \div (1/5)$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (1/5) = 20$ because $20 \times (1/5) = 4$.</i>	Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.
5.NF.7c	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Solve 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. <i>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?</i>	Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.
5.MD.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.	
5.MD.2	Make a line plot to display a data set of measurements in fractions of a unit ($1/2, 1/4, 1/8$). Use operations on fractions for this grade to solve problems involving information presented in line plots. <i>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.</i>	The term dot plot is interchangeable with line plot.
5.MD.3a	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. 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.	

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CCSS Standard Key	Standard Text	Supplemental Assessment Information
5.MD.3b	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. 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.	The term capacity is often used when addressing volume. It is defined as the maximum amount or number that can be contained or accommodated, e.g., a jug with a one-gallon capacity; the auditorium was filled to capacity.
5.MD.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	The term non-standard is interchangeable with improvised.
5.MD.5a	Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show 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. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.	The term edge lengths is interchangeable with side lengths for this standard.
5.MD.5b	Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. Apply 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.	More commonly, the formula for finding the volume of a right-rectangular prism using the area of its base and its height is $V = B \times h$ where B represents the area of the base.
5.MD.5c	Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. Recognize volume as additive. Find 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.	

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5.G.1	Use 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. Understand 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., <i>x</i> -axis and <i>x</i> -coordinate, <i>y</i> -axis and <i>y</i> -coordinate).	
5.G.2	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.	
5.G.3	Understand that attributes belonging to a category of two-dimensional figures also belong 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.	
5. G.4	Classify two-dimensional figures in a hierarchy based on properties	For example, all rectangles are parallelograms, because they are all quadrilaterals with two pairs of opposite-sides parallel.

Grade 5 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 5 RICAS Achievement Level Descriptors

Grade 5	Partially Meets Expectations <i>On RICAS, a student at this level:</i>	Meeting Expectations <i>On RICAS, a student at this level:</i>	Exceeding Expectations <i>On RICAS, a student at this level:</i>
Conceptual Understanding and Procedural Knowledge	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Applies understanding of the base-ten 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 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Applies learned procedures to solve routine problems • Uses concrete objects or pictures to help conceptualize and solve problems. 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 5 RICAS Achievement Level Descriptors

Grade 5	Partially Meets Expectations <i>On RICAS, a student at this level:</i>	Meeting Expectations <i>On RICAS, a student at this level:</i>	Exceeding Expectations <i>On RICAS, a student at this level:</i>
Mathematical Reasoning	<ul style="list-style-type: none"> Applies some reasoning methods to solve routine problems 	<ul style="list-style-type: none"> Uses a variety of reasoning methods to solve routine and non-routine problems Uses symbols to solve routine mathematical problems 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Identifies and uses basic terms 	<ul style="list-style-type: none"> Uses logical forms of representation (e.g., text, graphs, symbols) to illustrate steps to a solution 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Recognizes when parentheses, brackets, or braces are appropriately used in numerical expressions Given two rules, generates numerical patterns 	<ul style="list-style-type: none"> Uses parentheses, brackets, or braces to write, interpret and evaluate numerical expressions Interprets numerical expressions without evaluating Given two rules, identifies the relationship between corresponding terms 	<ul style="list-style-type: none"> Given two rules, forms and graphs ordered pairs and interprets the relationship between corresponding terms
Number and Operations in Base Ten	<ul style="list-style-type: none"> Recognizes that in a multi-digit number, including a decimal, a digit in any place represents 10 times as much as it represents in the place to its right or 1/10 of what it represents in the place to its left Reads decimals to thousandths using base-ten numerals, number names, and expanded form 	<ul style="list-style-type: none"> Uses whole number exponents to denote powers of 10 Writes decimals to thousandths using base ten numerals, number names, expanded form and comparison symbols Uses place value to round decimals to any place Fluently multiplies multi-digit whole numbers 	<ul style="list-style-type: none"> Uses place value understanding of multi-digit numbers including decimals to explain patterns in the number of zeros and the placement of the decimal point, when multiplying a number by powers of 10. Compares decimals using expanded form Makes reasonable estimates of decimal results

Grade 5 RICAS Achievement Level Descriptors

Grade 5	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:
Number and Operations in Base Ten	<ul style="list-style-type: none"> • Compares decimals using base ten numerals, number names and comparison symbols $<$, $>$ and $=$ • Uses various strategies to solve problems involving all operations with whole numbers including division limited to four-digit dividends and two-digit divisors • Identifies the quotient of whole numbers • Solves problems involving addition and subtraction with decimals to tenths 	<ul style="list-style-type: none"> • Solves mathematical and real-world problems involving multiplication of whole numbers and decimals to hundredths using the standard algorithm • Uses models to find the quotients of whole numbers. • Explains calculations or solutions of problems using rectangular arrays and/or area models • Solves problems involving all operations on decimals to hundredths 	<ul style="list-style-type: none"> • Explains understandings of models for decimals, decimal notation, and properties of operations to add, subtract, multiply and divide decimals to hundredths • Uses the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers to understand and explain why the procedures for multiplying and dividing finite decimals make sense
Number and Operations - Fractions	<ul style="list-style-type: none"> • Adds and subtracts fractions with like denominators (including mixed numbers) • Uses visual fraction models to multiply fractions or whole numbers by fractions • Finds areas of rectangles with fractional side lengths by tiling with unit squares • Recognizes multiplication as scaling by comparing the size of a product to the size of one factor on the basis of the size of the other factor with computation 	<ul style="list-style-type: none"> • Adds and subtracts fractions with unlike denominators (including mixed numbers) • Uses visual fraction models to solve real-world problems by multiplying fractions or whole numbers by fractions, and fractions by mixed numbers • Shows that the area of rectangles with fractional side lengths, found by tiling with unit squares, is the same as the product of the side lengths • Recognizes multiplication as scaling by comparing the size of a product to the size of one factor on the basis of the size of the other factor without computation 	<ul style="list-style-type: none"> • Applies understanding of fractions and fraction models to represent the addition and subtraction of fractions when solving word problems. • Uses understanding of fraction equivalence to make sense of sums and differences of fractions, and makes reasonable estimates of them. • Uses the relationship between multiplication and division of fractions to solve and explain mathematical and real-world problems including finding the area of rectangles with fractional side lengths, and finding quotients of division of non-zero whole numbers by unit fractions

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Number and Operations - Fractions		<ul style="list-style-type: none"> • Interprets division of a unit fraction by a non-zero whole number and division of a whole number • Solves real-world and mathematical problems involving division of a unit fraction by a non-zero whole number and a whole number by a unit fraction 	
Measurement and Data	<ul style="list-style-type: none"> • Converts among different-sized measurement units within a given measurement system • Interprets and represents data in line plots (dot plots) to solve problems • Recognizes volume as an attribute of solid figures and calculates volume of right rectangular prisms by packing the prisms with unit cubes, and counting the unit cubes, using standard and non-standard units 	<ul style="list-style-type: none"> • Converts among different-sized measurement units within a given measurement system to solve multi-step real-world problems • Uses a line plot (dot plot) to represent data and uses operations on fractions to solve problems involving the line plots • Recognizes volume as additive and calculates volume by finding the total number of same-size units of volume required to fill a space without gaps or overlaps. • Decomposes three-dimensional shapes and finds volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes 	<ul style="list-style-type: none"> • Uses appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume with application of the volume formula • Solves real-world application problems requiring the application of $V=lwh$ and $V=Bh$ • Decomposes three-dimensional shapes and finds volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes and relates to the volume formula

Grade 5 RICAS Achievement Level Descriptors

Grade 5	Partially Meets Expectations <i>On RICAS, a student at this level:</i>	Meeting Expectations <i>On RICAS, a student at this level:</i>	Exceeding Expectations <i>On RICAS, a student at this level:</i>
Geometry	<ul style="list-style-type: none"> • Represents mathematical and real-world problems by locating points in the first quadrant • Identifies two-dimensional figures based on properties 	<ul style="list-style-type: none"> • Represents mathematical and real-world problems by locating and graphing in the first quadrant • Classifies two-dimensional figures in a hierarchy based on properties 	<ul style="list-style-type: none"> • Solves mathematical and real-world problems by graphing in the first quadrant and interpreting the coordinate values of points based on the context of the situation • Applies knowledge of number and length to the order and distance relationships of a coordinate plane