5TH GRADE

MATH STANDARDS GUIDANCE

WI Math Standards

Bridges alignment to WI Math Standards

Domain: Operations and Algebraic Thinking

CLUSTER	STANDARD	EXAMPLES
A. Write and interpret numerical expressions.	M.5.OA.A.1: Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.	
	M.5.OA.A.2: Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.	*For example, express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognize that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product*
B. Analyze patterns and relationships.	M.5.OA.B.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.	*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.*

Domain: Number and Operations in Base Ten

CLUSTER	STANDARD	EXAMPLES
A. Understand the place value system.	M.5.NBT.A.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.	
	M.5.NBT.A.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.	
	M.5.NBT.A.3: Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 x (1/10) + 9 x (1/100) + 2 x (1/1000). b. Compare decimals to thousandths based on meanings of the digits in each place and describe the result of the comparison using words and symbols (>, =, and <).	
	M.5.NBT.A.4: Use place value understanding to generate estimates for problems in real-world situations, with decimals, using strategies such as mental math, benchmark numbers, compatible numbers, and rounding. Assess the reasonableness of their estimates (e.g. Is my estimate too low or too high? What degree of precision do I need for this situation?)	
B. Perform operations with multi-digit whole numbers and with decimals to hundredths.	M.5.NBT.B.5: Flexibly and efficiently multiply multi-digit whole numbers using strategies or algorithms based on place value, area models, and the properties of operations.	
	M.5.NBT.B.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, or area models.	
	M.5.NBT.B.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.	

Domain: Number and Operations -- Fractions

CLUSTER	STANDARD	EXAMPLES
A. Use equivalent fractions as a strategy to add and subtract fractions.	M.5.NF.A.1: Add and subtract fractions and mixed numbers using flexible and efficient strategies, including renaming fractions with equivalent fractions. Justify using visual models (e.g., tape diagrams or number lines) and equations.	*For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12.*
	M.5.NF.A.2: Solve word problems involving addition and subtraction of fractions referring to the same whole 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	*For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 <1/2.*
	M.5.NF.B.3: Interpret a fraction as an equal sharing division situation, where a quantity (the numerator) is divided into equal parts (the denominator). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, by using visual fraction models (e.g., tape diagrams or area models) or equations to represent the problem.	*For example, 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. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	M.5.NF.B.4: Apply and extend previous understandings of multiplication to multiply a fraction times a whole number (e.g., 2/3 x 4) or a fraction times a fraction (e.g., 2/3 x 4/5), including mixed numbers. a. Represent word problems involving multiplication of fractions using visual models to develop flexible and efficient strategies. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. b. 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.	
	M.5.NF.B.5: Interpret multiplication as scaling (resizing) by estimating whether a product will be larger or smaller than a given factor on the basis of the size of the other factor, without performing the indicated multiplication. a. Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number and explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. b. Relate the principle of fraction equivalence to the effect of multiplying or dividing a fraction by 1 or an equivalent form of 1 (e.g., 3/3, 5/5).	
	M.5.NF.B.6: Solve real-world problems involving multiplication of fractions and mixed numbers by using visual fraction models (e.g., tape diagrams, area models, or number lines) and equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.	
	M.5.NF.B.7: Apply and extend previous understandings of division to divide unit fractions by whole numbers (e.g., 1/3 ÷ 4) and whole numbers by unit fractions (e.g., 4 ÷ 1/5). Students able to multiply fractions can develop strategies to divide fractions by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade. a. Interpret and represent division of a unit fraction by a non-zero whole number as an equal sharing division situation. b. Interpret and represent division of a whole number by a unit fraction as a measurement division situation. c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and equations to represent the problem.	*a. 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.* *b. 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.* *c. For example, how much chocolate will each person get if 4 people share 1/3 lb. of chocolate equally? Each person gets 1/12 lb. of chocolate. How many 1/5-cup servings are in 4 cups of raisins? There are 20 servings of size 1/5-cup of raisins.*

Domain: Measurement and Data		
CLUSTER	STANDARD	EXAMPLES
A. Convert like measurement units within a given measurement system.	M.5.MD.A.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.	

B. Represent and interpret data.	M.5.MD.B.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.	*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.*
C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	M.5.MD.C.3: Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. 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. b. 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.	
	M.5.MD.C.4: Measure volumes by counting unit cubes, using cubic cm, cubic in., cubic ft., and improvised units.	
	M.5.MD.C.5: Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. a. 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. b. Apply the formulas V = l x w x h and V = B x 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. c. Recognize volume as additive. Find volumes of solid figures composed of two nonoverlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.	

Domain: Geometry		
CLUSTER	STANDARD	EXAMPLES
A. Graph points on the coordinate plane to solve real-world and mathematical problems.	M.5.G.A.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., x-axis and x-coordinate, y-axis and y-coordinate).	
	M.5.G.A.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.	
B. Classify twodimensional figures into categories based on their properties.	M.5.G.B.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.*
	M.5.G.B.4: Classify two-dimensional figures in a hierarchy based on properties.	

Standards for Mathematical Practice	
CLUSTER	STANDARD

Math Practice 1: Make sense of problems and persevere in solving them.	K-5: Mathematically proficient elementary students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. For example, instead of hunting for “key words” in a word problem, students might use concrete objects or pictures to show the actions of a problem, such as counting out and joining two sets. If students are not at first making sense of a problem or seeing a way to begin, they ask questions about what is happening in the problem that will help them get started. As they work, they continually ask themselves, “Does this make sense?" When they find that their solution pathway does not make sense, they look for another pathway that does. They may consider simpler forms of the original problem; for example, they might replace multi-digit numbers in a word problem with single-digit numbers to better appreciate the quantities in the problem and how they relate. Mathematically proficient students consider different solution pathways, both their own and those of other students, in order to identify and analyze connections among approaches. They can explain connections among physical models, pictures, diagrams, equations, verbal descriptions, tables, and graphs. Once students have a solution, they often check their answers to problems using a different approach.
Math Practice 2: Reason abstractly and quantitatively.	K-5: Mathematically proficient elementary students make sense of quantities and their relationships in problem situations. They can contextualize quantities and operations by using visual representations or stories. They interpret symbols as having meaning, not just as directions to carry out a procedure. Even as they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numerical relationships, numbers, and geometric objects. They can contextualize an abstract problem by placing it in a context that they can then use to make sense of the mathematical ideas. For example, if a student chooses to evaluate the expression 13 x 25 mentally, the student might think of a context to help produce a strategy—for example, by thinking “Thirteen groups of 25 is like having 13 quarters.” This prompts a strategy of thinking "I know that 10 quarters is $2.50 and 3 quarters is $0.75. $2.50 and $0.75 is $3.25." In this example the student uses a context to think through a strategy for solving the problem, using their knowledge of money and of Wisconsin Standards for Mathematics 25 decomposing one factor based on place value (13 = 10+3). The student then uses the context to identify the solution to the original problem. Mathematically proficient students can also make sense of a contextual problem and express the actions or events that are described in the problem using numbers and symbols. If they work with the symbols to solve the problem, they can then interpret their solution in terms of the context. Consider the problem: A teacher wants to bring 10 pumpkins to school to decorate the classroom. Some are big pumpkins and some are small pumpkins. How many of each size pumpkin might the teacher bring to school? When students create the number sentence 4+6=10, they have decontextualized the problem and expressed it with numbers and symbols. When they can explain that the number sentence means, “4 big pumpkins plus 6 small pumpkins equals 10 pumpkins,” they demonstrate their ability to recontextualize the numbers and equation back to the word problem.
Math Practice 3: Construct viable arguments, and appreciate and critique the reasoning of others.	K-5: Mathematically proficient elementary students construct verbal and written mathematical arguments that explain the reasoning underlying a strategy, solution, or conjecture. Arguments might use concrete referents such as objects, drawings, diagrams, and actions. Arguments might also rely on definitions, previously established results, properties, or structures. For example, a student might argue that 1/5 >1/9 on the basis that one of 5 equal parts of a whole is larger than one of 9 equal parts of that whole, because with more equal parts, the size of each part must be smaller. Another example is reasoning that two different shapes have equal area because it has already been demonstrated that they are each half of the same rectangle. Students might also use counterexamples to argue that a conjecture is not true—for example, a rhombus is an example that shows that not all quadrilaterals with four equal sides are squares; or, multiplying by 1 shows that a product of two whole numbers is not always greater than each factor. Mathematically proficient students present their arguments in the form of representations, actions on those representations, explanations in words (oral or written), or a combination of these three. Some of their arguments apply to individual problems, but others are about conjectures based on regularities they have noticed across multiple problems (Math Practice 8). As they articulate and justify generalizations, students consider to which mathematical objects (numbers or shapes, for example) their generalizations apply. For example, primary grade students may believe a generalization about the behavior of addition applies to positive whole numbers less than 100 because those are the numbers with which they are currently familiar. As they expand their understanding of the number system, they may reexamine their conjecture for numbers in the hundreds and thousands. Intermediate grade students return to their conjectures and arguments about whole numbers to determine whether they apply to fractions and decimals. Wisconsin Standards for Mathematics 26 While communicating their own mathematical ideas is important, elementary students also learn to be open to others’ mathematical ideas. They appreciate a different perspective or approach to a problem and learn how to respond to those ideas, respecting the reasoning of others (Gutiérrez 2017, 17-18). Together, students make sense of the mathematics, asking helpful questions that clarify or deepen everyone’s understanding, and reconsider their own arguments in response to the collaboration.
Math Practice 4: Model with mathematics.	K-5: “In the course of a student’s mathematics education, the word ‘model’ is used in many ways. Several of these, such as manipulatives, demonstration, role modeling, and conceptual models of mathematics, are valuable tools for teaching and learning. However, they are different from the practice of mathematical modeling. Mathematical modeling, both in the workplace and in school, uses mathematics to answer big, messy, reality-based questions (Bliss and Libertini 2016, 7). “ Mathematically proficient elementary students formulate their own problems that emerge from natural circumstances as they mathematize the world around them. They can identify the mathematical elements of a situation and generate questions that can be addressed using mathematics (e.g., noticing and wondering). Students dig into the context and make assumptions as they decide “what matters.” Mathematically proficient elementary students understand that there are multiple solutions to a modeling problem so they are working to find a solution rather than the solution. Students make judgements about what matters and assess the quality of their solution (Bliss and Libertini 2016, 10). They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving their mathematical modeling approach if it has not served its purpose. As they decontextualize the situation and represent it mathematically, they are also reasoning abstractly (Math Practice 2). In the elementary grades, students encounter mathematical modeling opportunities each and every day at school and at home. Students might consider how the classroom’s set of blocks should be shared throughout recess time. Students might then need to make assumptions about how many blocks each student should have as well as the length of time each student should have the blocks. Once a solution is determined, students could be asked to refine their model by posing the question, “What if one of our friends will not be at recess?” Children might also be presented with a bag of apples and simply asked “Is this enough for our class/family?” or consider the question, “Is the carpet in our classroom big enough for our bodies?” Note: Although physical objects and visuals can be used to model a situation, using these tools absent a contextual situation is not an example of Math Practice 4. For example, solving a word problem using counters or a tape diagram would not be modeling with mathematics, instead this is modeling the mathematics. Math Practice 4 is about engaging in solving authentic real-world problems.

Math Practice 5: Use appropriate tools strategically.	K-5: Mathematically proficient elementary students strategically consider the tools that are available when solving a mathematical problem, whether in a real-world or mathematical context. These tools might include physical objects (e.g., manipulatives, pencil and paper, rulers), conceptual tools (e.g., properties of operations, algorithms), drawings or diagrams (e.g., number lines, tally marks, tape diagrams, arrays, tables, graphs), and available technologies (e.g., calculators, online apps). Mathematically proficient students are sufficiently familiar with tools appropriate for their grade and areas of content to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained from their use as well as their limitations. Students choose tools that are relevant and useful to the problem at hand. For example, when determining how to measure length, students may compare the benefits of using non-standard units of measure (e.g., their own hands, paperclips) versus standard units and tools (e.g., an inch or centimeter ruler). As another example, when presented with 1002-3 or 101-98, students subtract strategically, which may involve reasoning, counting, or decomposing rather than using a written algorithm.
Math Practice 6: Attend to precision.	K-5: Mathematically proficient elementary students use precise language to communicate orally and in written form. They come to appreciate, understand, and use mathematical vocabulary not in isolation, but in the context of doing mathematical thinking and problem solving. They may start by using everyday language to express their mathematical ideas and gradually select words with greater clarity and specificity. For example, they may initially use the word "triangle" to refer only to equilateral triangles resting on their bases, but come to understand and use a more precise definition of a triangle as a closed figure with three straight sides. As another example, they may initially explain a solution by saying, "it works" without explaining what "it" means but later clarify their explanation with specific details. In using mathematical representations, students provide appropriate labels to precisely communicate the meaning of their representations (e.g., charts, graphs, and drawings). When making mathematical arguments about a solution, strategy, or conjecture (Math Practice 3), mathematically proficient students learn to craft careful explanations that communicate their reasoning by referring specifically to each important mathematical element, describing the relationships among them, and connecting their words clearly to their representations. Students use mathematical symbols correctly and can describe the meaning of the symbols they use. For example, they use the equal sign consistently and appropriately. They state the meaning of the symbols they choose in relation to the problem at hand. Wisconsin Standards for Mathematics 28 Students use tools and strategies (e.g., measuring tools, estimation) effectively, to maintain a level of precision that is appropriate to the situation. They specify units of measure where needed. Perseverance and attention to detail are mathematical habits of mind; mathematically proficient students check for reasonableness and accuracy by solving a problem a second way, analyzing errors, and learning from them.
Math Practice 7: Look for and make use of structure.	Mathematically proficient elementary students use structures such as place value, the properties of operations, and attributes of shapes to solve problems. In many cases, they have identified and described these structures through repeated reasoning (Math Practice 8). When students use an algorithm to solve 53-17 in order to fully understand how to decompose the tens and ones, they must understand that 53 can be seen as 4 tens and 13 ones, not just 5 tens and 3 ones. When younger students recognize that adding 1 results in the next counting number, they are identifying the basic structure of whole numbers. When older students calculate 16 x 9, they might apply the structure of place value and the distributive property to find the product: 16 x 9 = (10 + 6) x 9 = (10 x 9) + (6 x 9). To determine the volume of a 3 x 4 x 5 rectangular prism, students might see the structure of the prism as five layers of 3 x 4 arrays of cubes. Students in elementary grades look for and make use of structure when they view expressions as objects to observe and interpret. For example, students might observe that 120 – 41 must be one less than 120 – 40 because "if you subtract one more, the result will be one less" (Math Practice 8). Students can interpret the expression 5 x 3 + 6 x 3 as "five groups of three and six more groups of three" or notice there are a total of 11 groups of 3. A word problem that involves distributing 29 marbles among 4 vases could lead (Math Practice 4) to an equation model (29 – 1) ÷ 4 = 7, where the expression on the left-hand side not only has the value 7 but also suggests, based on its structure, a process of discarding 1 marble and dividing the rest of the marbles equally into 4 groups of 7.
Math Practice 8: Look for and express regularity in repeated reasoning.	Mathematically proficient elementary students look for and identify regularities as they solve multiple related problems. Students make and test conjectures, reason about and express these regularities as generalizations about structures and relationships, and then use those generalizations to solve problems (Math Practice 7). For example, younger students might notice that when tossing two-color counters to find combinations of a given number, over time students will notice a pattern (commutative property of addition). For example, when tossing six 2-sided counters, they may get 2 red, 4 yellow and 4 red, 2 yellow and when tossing 4 counters, they get 1 red, 3 yellow and 3 red, 1 yellow. Wisconsin Standards for Mathematics 29 In the elementary grades students can recognize and use patterns to help them become flexible with addition. For example, given the number string below, students may recognize they can take one away from the 5 and add it to the first number to make a multiple of ten. They also may notice a pattern related to the first digit increasing by 10, therefore the answer increases by 10. 9+5 19+5 29+5 39+5 When drawing and representing fractions, students might notice a consistent relationship between the numerator and denominator of fractions that equal one half (e.g., that the numerator is half the denominator and the denominator is two times the numerator). They can generalize from these repeated examples that all fractions equal to one half show this relationship. As students practice articulating their observations both verbally and in writing, they learn to communicate with greater precision (Math Practice 6). As they explain why these generalizations must be true, they construct, critique, and compare arguments (Math Practice 3).