|  |
| --- |
| **4th Grade Mathematics – Planning Tool** |
| Collaborators: | Academic Year: |
| *This planning tool can be used by collaborating teachers across a given school year or term to help insure full implementation of the Iowa Core Content Standards into their classroom instructional and assessment activities.* *Full implementation is accomplished when the district or school is able to provide evidence that an ongoing process is in place to ensure that each and every student is learning the standards and the essential concepts and skills of the Iowa Core. A school that has fully implemented the Iowa Core is engaged in an ongoing process of data gathering and analysis, decision making, identifying actions, and assessing the impact around alignment and professional development focused on content, instruction, and assessment. The school is fully engaged in a continuous improvement process that specifically targets improved student learning and performance.* ***Effective implementation of the Iowa Core is not a simple checklist. Implementation requires that educators strategically and systematically address the knowledge and skills being taught, engage in collaboration around the use of effective instructional practices and materials and develop activities to elicit evidence of student learning that match the level of rigor called for in the standards.*** |
| **Mathematic Content Standard** | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** | **Apr.** | **May** |
| **Operations and Algebraic Thinking: Use the four operations with whole numbers to solve problems.**  |
| 1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 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.1.)(DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.OA.2.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.OA.3.) (DOK 1,2,3)**
 |  |  |  |  |  |  |  |  |  |  |
| **Operations and Algebraic Thinking: Gain familiarity with factors and multiples.** |
| 1. 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. **(4.OA.4.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
|  | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** | **Apr.** | **May** |
| **Operations and Algebraic Thinking: Generate and analyze patterns.** |
| 1. 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. **(4.OA.5.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| **Number and Operations in Base Ten: Generalize place value understanding for multi-digit whole numbers.** |
| 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*.* **(4.NBT.1.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.NBT.2.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. Use place value understanding to round multi-digit whole numbers to any place. **(4.NBT.3.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| **Number and Operations in Base Ten: Use place value understanding and properties of operations to add and subtract.** |
| 1. Fluently add and subtract multi-digit whole numbers using the standard algorithm. **(4.NBT.4.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.NBT.5.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.NBT.6.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** | **Apr.** | **May** |
| **Number and Operations—Fractions: Extend understanding of fraction equivalence and ordering.**  |
| 1. Explain why a fraction *a*/*b* is equivalent to a fraction (*n* × *a*)/(*n* × *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. **(4.NF.1.) (DOK 1,2,3)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.NF.2.) (DOK 1,2,3)**
 |  |  |  |  |  |  |  |  |  |  |
| **Number and Operations—Fractions: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.** |
| 1. Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. **(4.NF.3.) (DOK 1,2,3)**
	1. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
 |  |  |  |  |  |  |  |  |  |  |
| * 1. 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. *Examples: 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.*
 |  |  |  |  |  |  |  |  |  |  |
| * 1. 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.
 |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** | **Apr.** | **May** |
| * 1. 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.
 |  |  |  |  |  |  |  |  |  |  |
| 1. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. **(4.NF.4.) (DOK 1,2)**
	1. 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 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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?*
 |  |  |  |  |  |  |  |  |  |  |
| **Number and Operations - Fractions: Understand decimal notation for fractions, and compare decimal fractions.** |
| 1. 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.* **(4.NF.5.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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.* **(4.NF.6.)(DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
|  | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** | **Apr.** | **May** |
| 1. 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. **(4.NF.7.) (DOK 1,2,3)**
 |  |  |  |  |  |  |  |  |  |  |
| **Measurement and Data: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** |
| 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. **(4.MD.1.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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.2.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. Apply the area and perimeter formulas for rectangles in real world and mathematical problems.**(4.MD.3.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| **Measurement and Data: Represent and interpret data.** |
| 1. 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. **(4.MD.4.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** | **Jan.** | **Feb.** | **Mar.** | **Apr.** | **May** |
| **Measurement and Data: Geometric measurement - understand concepts of angle and measure angles.** |
| 1. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: **(4.MD.5.) (DOK 1)**
	1. 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.
 |  |  |  |  |  |  |  |  |  |  |
| 1. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.
 |  |  |  |  |  |  |  |  |  |  |
| 1. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. **(4.MD.6.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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. **(4.MD.7.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| **Geometry: Draw and identify lines and angles, and classify shapes by properties of their lines and angle.** |
| 1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. **(4.G.1.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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.2.) (DOK 1,2)**
 |  |  |  |  |  |  |  |  |  |  |
| 1. 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.2.) (DOK 1)**
 |  |  |  |  |  |  |  |  |  |  |
| **Mathematics Depth-Of-Knowledge Definitions - Mathematics** |
|  |

|  |
| --- |
|  |
| *Level 1 (Recall of a fact or information procedure)* includes the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify a Level 1 include “identify,” “recall,” “recognize,” “use,” and “measure.” Verbs such as “describe” and “explain” could be classified at different levels depending on what is to be described and explained. Examples: |

* Recall or recognize a fact, term or property
* Represent in words, pictures or symbols in a math object or relationship
* Perform routine procedure like measuring

Level 2 (Basic Reasoning: Use information or conceptual knowledge, two or more steps) includes the engagement of some mental processing beyond a habitual response. A Level 2 assessment item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include “classify,” “organize,” ”estimate,” “make observations,” “collect and display data,” and “compare data.” These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects.

Some action verbs, such as “explain,” “describe,” or “interpret” could be classified at different levels depending on the object of the action. For example, if an item required students to explain how light affects mass by indicating there is a relationship between light and heat, this is considered a Level 2. Other Level 2 activities include explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

* Specify and explain relationships between facts, terms, properties or operations
* Select procedure according to criteria and perform it
* Solve routine multiple-step problems

|  |
| --- |
| *Level 3 (Complex Reasoning: Requires reasoning, developing a plan or a sequence of steps, working with some complexity, and considering more than one possible approach and answer)* requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is a Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does **not** result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve problems. |

* Analyze similarities and differences between procedures
* Formulate original problem given situation
* Formulate mathematical model for complex situation

|  |
| --- |
| *Level 4 (Extended Reasoning: Requires an investigation, time to think and process multiple conditions of the problem)* requires complex reasoning, planning, developing, and thinking most likely over an extended period of time. The extended time period is **not** a distinguishing factor if the required work is only repetitive and does **not** require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections—relate ideas within the content area or among content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include designing and conducting experiments; making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.  |

* Apply mathematical model to illuminate a problem, situation
* Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
* Design a mathematical model to inform and solve a practical or abstract situation