# Mathematics Assessment

## Mathematics Grade 4 Threshold Achievement Level Descriptors (ALD)

### With Claims, Targets and Standards

This document aligns the Oregon Mathematics Assessment claims and targets with the Oregon mathematics standards. The claims and targets can be used to design classroom lessons and district assessments. In addition, the document serves as a guide in understanding the Oregon Mathematics Assessment reports.

**CLAIMS AND TARGETS:** Content claims are summary statements about the knowledge and skills students are expected to demonstrate on the assessment related to a particular aspect of the standards. Within each claim area, assessment targets were developed to ensure inclusion of standards, learning progressions, and the Depth of Knowledge levels.

**DEPTH OF KNOWLEDGE:** The DOK level assigned should reflect the level of work students are most commonly required to perform in order for the response to be deemed acceptable. The DOK level should reflect the complexity of the cognitive processes demanded by the task, rather than its difficulty. Ultimately the DOK level describes the kind of thinking required by a task, not whether or not the task is "difficult".

- **Level 1** requires students to receive or recite facts or to use simple skills or abilities.
- **Level 2** includes the engagement of some mental processing beyond recalling or reproducing a response. Includes conceptual understanding generally refers to the integration and application of concepts and other ideas within a content area. Procedural understanding denotes knowledge about skills and sequence of steps, when and how these should be used appropriately, and their efficient and accurate applications.
- **Level 3** requires strategic thinking. Students must be able to support their thinking. Includes, non-routine problem solving like in reading and determining author's purpose.
- **Level 4** requires extended thinking. Usually requires work over a period of time. They may also be asked to develop hypotheses and perform complex analyses of the connections among texts.

Developed by Terri Gibbs-Burke. Modified and updated by the Oregon Department of Education

| **Claim 1 Concepts and Procedures:** Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. | | | | | |
|---|---|---|---|---|---|
| **Targets** | | **Content Standards** | **Threshold Achievement Level Descriptors (ALD) Students Entering Level (2, 3, or 4) will be able to…** | **Item Types** | |
| | | | | **CAT** | **PT** |
| **PRIORITY CLUSTER** | **Target A** Use the four operations with whole numbers to solve problems.<br>(DOK 1, 2) | **4.OA.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.<br>**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.<br>**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. | • **2** Add and subtract to solve one-step problems involving an unknown number.<br>• **3** Multiply and divide to solve one-step problems involving equal groups or arrays.<br>• **4** Assess the reasonableness of answers using mental computation and estimation strategies, including rounding. | 3 | 0 |
| | **Target E** Use place value understanding and properties of operations to perform multi-digit arithmetic.<br>(DOK 1, 2) | **4.NBT.4**: Fluently add and subtract multi-digit whole numbers using the standard algorithm.<br>**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.<br>**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 | • **2** Look for and use repeated reasoning to generalize place value understanding in order to read and write multi-digit whole numbers less than or equal to 100,000 using base-ten numerals and number names.<br>Use place value understanding to add and subtract two- and three-digit whole numbers using a standard algorithm.<br>• **3** Read and write multi-digit whole numbers less than or equal to 1,000,000 using base-ten numerals, number names, and expanded form.<br>Multiply four-digit whole numbers by a one-digit number.<br>• **4** N/A | | |
| | **Target F** Extend understanding of fraction equivalence and ordering.<br>(DOK 1, 2) | **4.NF.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.<br>**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. | • **2** Recognize equivalent fractions using visual models.<br>Use visual fraction models to represent a problem.<br>Express a fraction with denominator 10 as an equivalent fraction with denominator 100.<br>• **3** Generate equivalent fractions using visual models.<br>Identify and generate equivalent forms of a fraction with like denominators.<br>Add two fractions with respective denominators 10 and 100.<br>• **4** Compare two fractions with different numerators and different denominators using <, >, and =.<br>Compare two decimals to the hundredths using <, >, and = or a number line and justify the conclusions by using visual models. | | |

| | | | | | |
|---|---|---|---|---|---|
| | **Target D** Generalize place value understanding for multi-digit whole numbers. (DOK 1, 2) | **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 ÷ 70 = 10 by applying concepts of place value and division.<br>**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.<br>**4.NBT.3** Use place value understanding to round multi-digit whole numbers to any place. | • **2** Look for and use repeated reasoning to generalize place value understanding in order to read and write multi-digit whole numbers less than or equal to 100,000 using base-ten numerals and number names.<br>Use place value understanding to add and subtract two- and three-digit whole numbers using a standard algorithm.<br>• **3** Read and write multi-digit whole numbers less than or equal to 1,000,000 using base-ten numerals, number names, and expanded form.<br>Multiply four-digit whole numbers by a one-digit number.<br>• **4** N/A | 1 | |
| | **Target G** Build fractions from unit fractions by applying and extending previous understandings of operation on whole numbers. (DOK 1, 2) | **4.NF.3**: Understand a fraction a/b with a > 1 as a sum of fractions 1/b.<br>**4.NF.4:** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. | • **2** Recognize equivalent fractions using visual models.<br>Use visual fraction models to represent a problem.<br>Express a fraction with denominator 10 as an equivalent fraction with denominator 100.<br>• **3** Generate equivalent fractions using visual models.<br>Identify and generate equivalent forms of a fraction with like denominators.<br>Add two fractions with respective denominators 10 and 100.<br>• **4** Compare two fractions with different numerators and different denominators using <, >, and =.<br>Compare two decimals to the hundredths using <, >, and = or a number line and justify the conclusions by using visual models. | 2 | 0 |
| | **Target H** Understand decimal notation for fractions and compare decimal fractions. (DOK 1, 2) | **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 100.4 For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.<br>**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.<br>**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. | • **2** Recognize equivalent fractions using visual models.<br>Use visual fraction models to represent a problem.<br>Express a fraction with denominator 10 as an equivalent fraction with denominator 100.<br>• **3** Generate equivalent fractions using visual models.<br>Identify and generate equivalent forms of a fraction with like denominators.<br>Add two fractions with respective denominators 10 and 100.<br>• **4** Compare two fractions with different numerators and different denominators using <, >, and =.<br>Compare two decimals to the hundredths using <, >, and = or a number line and justify the conclusions by using visual models. | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| **Supporting Cluster** | **Target I** Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.<br>(DOK 1, 2) | **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),…<br>**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.<br>**4.MD.3:** Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor. | • 2 Apply the perimeter formula to rectangles in mathematical problems.<br>Use data from a given line plot using fractions 1/2, 1/4, and 1/8 to solve one-step problems.<br>Recognize whole-number degrees on a protractor.<br>• 3 Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.<br>Interpret data from a line plot to solve problems involving addition of fractions with like denominators by using information presented in line plots.<br>Construct angles between 0 and 180 degrees in whole-number degrees using a protractor.<br>• 4 Apply the perimeter formula to rectangles in real-world problems.<br>Solve addition problems to find unknown angles on a diagram in mathematical problems. | 1 | 0 |
| | **Target K** Geometric measurement: understand concepts of angle and measure angles.<br>(DOK 1, 2) | **4.MD.5:** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement<br>**4.MD.5a:** 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.<br>**4.MD.5b:** An angle that turns through n one-degree angles is said to have an angle measure of n degrees.<br>**4.MD.6:** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.<br>**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. | • 2 Apply the perimeter formula to rectangles in mathematical problems.<br>Use data from a given line plot using fractions 1/2, 1/4, and 1/8 to solve one-step problems.<br>Recognize whole-number degrees on a protractor.<br>• 3 Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.<br>Interpret data from a line plot to solve problems involving addition of fractions with like denominators by using information presented in line plots.<br>Construct angles between 0 and 180 degrees in whole-number degrees using a protractor.<br>• **4** Apply the perimeter formula to rectangles in real-world problems.<br>Solve addition problems to find unknown angles on a diagram in mathematical problems. | | |
| | **Target B** Gain familiarity with factors and multiples.<br>(DOK 1, 2) | **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. | • **2** Determine whether a given whole number in the range of 1–100 is a multiple of a given one-digit number.<br>Generate a shape pattern that follows a given rule.<br>• **3** Find factor pairs for whole numbers in the range of 1–100.<br>Identify apparent features of a pattern in a problem with scaffolding.<br>• **4** N/A | 1* | |

| | | | | | |
|---|---|---|---|---|---|
| | **Target C** Generate and analyze patterns.<br>(DOK 2, 3) | **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. | • **2** Determine whether a given whole number in the range of 1–100 is a multiple of a given one-digit number.<br>• Generate a shape pattern that follows a given rule.**3** Find factor pairs for whole numbers in the range of 1–100.<br>Identify apparent features of a pattern in a problem with scaffolding.<br>• **4** N/A | 1* | 0 |
| | **Target J** Represent and interpret data.<br>(DOK 1, 2) | **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. | • **2** Apply the perimeter formula to rectangles in mathematical problems.<br>Use data from a given line plot using fractions 1/2, 1/4, and 1/8 to solve one-step problems.<br>Recognize whole-number degrees on a protractor.<br>• 3 Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.<br>Interpret data from a line plot to solve problems involving addition of fractions with like denominators by using information presented in line plots.<br>Construct angles between 0 and 180 degrees in whole-number degrees using a protractor.<br>• 4 Apply the perimeter formula to rectangles in real-world problems.<br>Solve addition problems to find unknown angles on a diagram in mathematical problems. | | |
| | **Target L** Draw and identify lines and angles, and classify shapes by properties of their lines and angles.<br>(DOK 1, 2) | **4.G.1:** Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.<br>**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.<br>**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. | • 2 Identify points, lines, line segments, and rays.<br>• 3Draw lines of symmetry for two-dimensional figures.<br>• 4 N/A | 1 | |
| | | | **Total Items for Claim #1** | **10** | **0** |

* Indicates one item total in Math CAT for Targets B, C, and J.

**Claim 2. Problem Solving and 4. Modeling and Data Analysis**: Students can solve a range of complex well posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies. Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

| | Targets | Content Standards | Threshold Achievement Level Descriptors (ALD) Students Entering Level (2, 3, or 4) will be able to… | Item Types | | Total Items |
|---|---|---|---|---|---|---|
| | | | | CAT | PT | |
| **Claim 2: Problem Solving<br>Claim 4: Modeling and Data Analysis** | **Claim 2**<br><br>**Target A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. (DOK 2, 3)<br>**Target B** Select and use appropriate tools strategically. (DOK 1, 2, 3)<br>**Target C** Interpret results in the context of a situation. (DOK 1, 2, 3)<br>**Target D**. Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flow charts, or formulas. (DOK 1, 2, 3) | **See content standards for Claim 1: Target A, E, F, G, H, I, J, and K** | • **2** Select tools to solve a familiar and moderately scaffolded problem and apply them with partial accuracy.<br><br>Use the necessary elements given in a problem situation to solve a problem.<br><br>Apply mathematics to propose solutions by identifying important quantities and by locating missing information from relevant external resources.<br><br>• **3** Use appropriate tools to accurately solve problems arising in everyday life, society, and the workplace.<br><br>Apply mathematics to solve problems by identifying important quantities and mapping their relationship and by stating and using logical assumptions.<br><br>• **4** Analyze and interpret the context of an unfamiliar situation for problems of increasing complexity.<br><br>Begin to solve problems optimally.<br><br>Construct multiple plausible solutions and approaches. | **Target A** 0-1<br><br>**Target B, C, D** 0-1 | **Claim 2** 1 - 2 | **5 - 7** |
| | **Claim 4**<br><br>**Target A**: Apply problems arising in everyday life, society, and the workplace. (DOK 2, 3)<br>**Target B:** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem. (DOK 2, 3, 4)<br>**Target C:** State logical assumptions being used. (DOK 1, 2, 3)<br>**Target D:** Interpret results in the context of a situation. (DOK 2, 3)<br>**Target E:** Analyze the adequacy of and make improvements to an existing model or develop a mathematical model of a real phenomenon. (DOK 2, 3, 4)<br>**Target F:** Identify important quantities I a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or (formulas). (DOK 1, 2, 3)<br>**Target G*:** Identify, analyze, and synthesize relevant external resources to pose or solve problems. (DOK 3, 4) | **See content standards for Claim 1: Target A, E, I, J and K** | | **Target A, D:** 0-1<br><br>**Target B, E 0**-1<br><br>**Target C, F** 0-1<br><br>**Target G:** 0 | **Claim 4** 1 - 3 | |

**Claim 3 Communicating Reasoning:** Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

| | Targets | Content Standards | Threshold Achievement Level Descriptors (ALD) Students Entering Level (2, 3, or 4) will be able to… | Item Types | | Total Items |
|---|---|---|---|---|---|---|
| | | | | CAT | PT | |
| **Claim 3: Communicating Reasoning** | **Claim 3**<br><br>**Target A:** Test propositions or conjectures with specific examples. (DOK 2, 3)<br>**Target B.** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. (DOK 2, 3, 4)<br>**Target C.** State logical assumptions being used. (DOK 2, 3)<br>**Target D.** Use the technique of breaking an argument into cases. (DOK 2, 3)<br>**Target E.** Distinguish correct logic or reasoning from that which is flawed and —if there is a flaw in the argument—explain what it is. (DOK 2, 3, 4)<br>**Target F.** Base arguments on concrete references such as objects, drawings, diagrams, and actions. (DOK 2, 3) | **See content standards for Claim 1:**<br>**Target A (4.OA.3), D, E (4.NBT.5 and 4.NBT.6), F, G, and H** | • **2** Find and identify the flaw in an argument.<br><br>• **3** Use stated assumptions, definitions, and previously established results and examples to identify and repair a flawed argument.<br><br>Use previous information to support his or her own reasoning on a routine problem.<br><br>• **4** Begin to construct chains of logic about abstract concepts autonomously. | **Target A, D** 1-2<br><br>**Target B, E** 1-2<br><br>**Target C, F** 1 | **0 - 2** | **4 - 6** |