# Mathematics Assessment

## Mathematics Grade 6 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.

| Claim 1 Concepts and Procedures: Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency. | | | | | |
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| **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 E** Apply and extend previous understanding of arithmetic to algebraic expressions. (DOK 1) | **6.EE.1:** Write and evaluate numerical expressions involving whole-number exponents. | • **2** Evaluate expressions with and without variables and without exponents. Write one- and two-step algebraic expressions introducing a variable. Solve one-variable equations and inequalities of the form x + p =/≤/≥/</> q or px =/≤/≥/</> q, where p and q are nonnegative rational numbers. Given a table of values for a linear relationship (y = kx or y = x ± c), create the equation.<br>• **3** Write and evaluate numerical expressions without exponents and expressions from formulas in real-world problems. Identify equivalent expressions. Write one-variable equations and inequalities of the form x + p =/≤/≥/</> q or px =/≤/≥/</> q, where p and q are nonnegative rational numbers. Graph solutions to equations and inequalities on the number line. Create the graph, table, and equation for a linear relationship (y = kx or y = x ± c) and make connections between the representations.<br>• **4** Using the properties of operations, show why two expressions are equivalent. Solve equations and inequalities of the form x + p =/≤/≥/</> q or px =/≤/≥/</> q, where p and q are rational numbers. Create the graph, table, and equation for nonlinear polynomial relationships, making connections between the representations. | 5 - 6 | 0 |
| | | **6.EE.2:** Write, read, and evaluate expressions in which letters stand for numbers. | | | |
| | | **6.EE.3:** Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y. | | | |
| | | **6.EE.4:** Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for | | | |
| | **Target F** Reason about and solve one-variable equations and inequalities. (DOK 1, 2) | **6.EE.5:** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. | | | |
| | | **6.EE.6:** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. | | | |
| | | **6.EE.7:** Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. | | | |
| | | **6.EE.8:** Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. | | | |
| | **Target A** Understand ratio concepts and use ration reasoning to solve problems. (DOK 1, 2) | **6.RP.1:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes." | • **2** Find unit rates given two whole number quantities where one evenly divides the other.<br>• **3** Solve unit rate problems. Solve percent problems by finding the whole, given a part and the percent. Describe a ratio relationship between any two number quantities and understand the concept of unit rate in problems (denominators less than or equal to 12).<br>• **4** Solve unfamiliar or multi-step problems by finding the whole, given a part and the percent. Understand and explain ratio relationships between any two number quantities. Identify relationships between models or representations. | 3 - 4 | |
| | | **6.RP.2:** Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." | | | |
| | | **6.RP.3:** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. | | | |

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| **PRIORITY CLUSTER** | **Target G** Represent and analyze quantitative relationships between dependent and independent variables. (DOK 2) | **6.EE.9:** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time. | • **2** Evaluate expressions with and without variables and without exponents. Write one- and two-step algebraic expressions introducing a variable. Solve one-variable equations and inequalities of the form x + p =/≤/≥/</> q or px =/≤/≥/</> q, where p and q are nonnegative rational numbers. Given a table of values for a linear relationship (y = kx or y = x ± c), create the equation.<br>• **3** Write and evaluate numerical expressions without exponents and expressions from formulas in real-world problems. Identify equivalent expressions. Write one-variable equations and inequalities of the form x + p =/≤/≥/</> q or px =/≤/≥/</> q, where p and q are nonnegative rational numbers. Graph solutions to equations and inequalities on the number line. Create the graph, table, and equation for a linear relationship (y = kx or y = x ± c) and make connections between the representations.<br>• **4** Using the properties of operations show why two expressions are equivalent. Solve equations and inequalities of the form x + p =/≤/≥/</> q or px =/≤/≥/</> q, where p and q are rational numbers.<br>Create the graph, table, and equation for nonlinear polynomial relationships, making connections between the representations | 2 | 0 |
| | **Target B** Apply and extend previous understanding of multiplication and division to divide fractions by fractions. (DOK 1, 2) | **6.NS.1:** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi? | • **2** Divide a whole number by a fraction between 0 and 1 and be able to connect to a visual model. Add and subtract multi-digit decimals. Find common factors of two numbers less than or equal to 40. Find multiples of two numbers less than or equal to 12.<br>• **3** Apply and extend previous understandings of multiplication and division to divide a mixed number by a fraction and be able to connect to a visual model. Multiply and divide multi-digit decimal numbers. Find the greatest common factor of two numbers less than or equal to 100 and the least common multiple of two numbers less than or equal to 12.<br>• **4** Use visual models in settings where smaller fractions are divided by larger fractions. Understand and apply the fact that a fraction multiplied or divided by 1 in the form of a/a is equivalent to the original fraction. | | |

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| **PRIORITY CLUSTER** | **Target D** Apply and extend previous understanding of numbers to the system of rational numbers. (DOK 1, 2) | **6.NS.5:** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. | • **2** Order fractions and integers. Place integer pairs on a coordinate plane with axis increments of 2, 5, or 10.<br>• **3** Place points with rational coordinates on a coordinate plane and combine absolute value and ordering, with or without models ($|-3|<|-5|$).<br>• **4** N/A | 2 |
| | | **6.NS.6:** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. | | |
| | | **6.NS.7:** Understand ordering and absolute value of rational numbers. | | |
| | | **6.NS.8:** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. | | |
| **SUPPORTING CLUSTER** | **Target C** Compute fluently with multi-digit numbers and find common factors and multiples. (DOK 1, 2) | **6.NS.2:** Fluently divide multi-digit numbers using the standard algorithm. | • **2** Divide a whole number by a fraction between 0 and 1 and be able to connect to a visual model. Add and subtract multi-digit decimals. Find common factors of two numbers less than or equal to 40. Find multiples of two numbers less than or equal to 12.<br>• **3** Apply and extend previous understandings of multiplication and division to divide a mixed number by a fraction and be able to connect to a visual model. Multiply and divide multi-digit decimal numbers. Find the greatest common factor of two numbers less than or equal to 100 and the least common multiple of two numbers less than or equal to 12.<br>• **4** Use visual models in settings where smaller fractions are divided by larger fractions. Understand and apply the fact that a fraction multiplied or divided by 1 in the form of a/a is equivalent to the original fraction. | 4 – 5* |
| | | **6.NS.3:** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. | | |
| | | **6.NS.4:** Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express 36 + 8 as 4 (9 + 2). | | |
| | **Target H** Solve real-world and mathematical problems involving area, surface area, and volume. (DOK 1, 2) | **6.G.1:** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. | • **2** Find areas of special quadrilaterals and triangles. Draw polygons in the four-quadrant plane.<br>• **3** Find areas of quadrilaterals and other polygons that can be decomposed into three or fewer triangles. Find the volume of right rectangular prisms with fractional or mixed number side lengths.<br>• **4** Solve problems by finding surface areas of triangular or rectangular prisms and triangular or rectangular pyramids. | 0 |
| | | **6.G.2:** Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. | | |
| | | **6.G.3:** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. | | |
| | | **6.G.4:** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. | | |

| | **Target I** Develop understanding of statistical variability. (DOK 2) | **6.SP.1:** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages. | • **2** Understand that questions that lead to variable responses are statistical questions and vice versa. Identify a reasonable measure of central tendency for a given set of numerical data. Find mean and median.<br>• **3** Identify a reasonable center and spread for a given context and understand how this relates to the overall shape of the data distribution. Understand that a measure of center summarizes all of its values with a single number. Summarize or display data in box plots. Find the interquartile range. Use range and measures of center to describe the shape of the data distribution as it relates to a familiar context. Pose statistical questions.<br>• **4** Predict effects on mean and median given a change in data points. Complete a data set with given measures (e.g., mean, median, mode, interquartile range). | 4 - 5* | 0 |
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| SUPPORTING CLUSTER | | **6.SP.2:** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. | | | |
| | | **6.SP.3:** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. | | | |
| | **Target J** Summarize and describe distributions. (DOK 1, 2) | **6.SP.4:** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. | | | |
| | | **6.SP.5:** Summarize numerical data sets in relation to their context, such as by:<br> **a.** Reporting the number of observations.<br> **b.** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. **c.** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. **d.** Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. | | | |
| | | | **Total Items for Claim #1** | **16-19** | **0** |

\*   Indicates 4 – 5 items total in Math CAT for Target C, H, I, and J.

| | Targets | Content Standards | Threshold Achievement Level Descriptors (ALD) Students Entering Level (2, 3, or 4) will be able to… | Item Types CAT | PT | Total Items |
|---|---|---|---|---|---|---|

**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… | CAT | PT | Total Items |
|---|---|---|---|---|---|---|
| **Claim 2: Problem Solving 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:**<br>**Target A, B, D, E, F, G, H** | • **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** 2<br><br>**Target B, C, D** 1 | 1 - 2 | 8-10 |
| | **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:**<br>**Target A, B, D, F, G, H, I, J** | | **Target A, D** 1<br><br>**Target B, E** 1<br><br>**Target C, F** 1<br><br>**Target G** 0 | 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**

**Target A:** Test propositions or conjectures with specific examples. (DOK 2, 3)
**Target B.** Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. (DOK 2, 3, 4)
**Target C.** State logical assumptions being used. (DOK 2, 3)
**Target D.** Use the technique of breaking an argument into cases. (DOK 2, 3)
**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)
**Target F.** Base arguments on concrete references such as objects, drawings, diagrams, and actions. (DOK 2, 3)
**Target G**. At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.) (DOK 2, 3) | **See content standards for Claim 1:**
**Target A, B, C, D, E, F, G** | • **2** Find and identify the flaw in an argument.

• **3** Use stated assumptions, definitions, and previously established results and examples to identify and repair a flawed argument.

Use previous information to support his or her own reasoning on a routine problem.

• **4** Begin to construct chains of logic about abstract concepts autonomously. | **Target A, D** 3

**Target B, E** 3

**Target C, F, G:** 2 | 0 - 2 | 8 – 10 |