Mathematics Assessment

Mathematics Grade 8 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 C** Understand the connections between proportional relationships, lines, and linear equations. (DOK 1, 2)	**8.EE.5:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	• **2** Find the cube of one-digit numbers and the cube root of perfect cubes (less than 1,000). Use appropriate tools (e.g., calculator, pencil and paper) to translate large numbers from scientific to standard notation. Identify the *y*-intercept and calculate the slope of a line from an equation or graph. Graph a system of linear equations and identify the solution as the point of intersection. • **3** Solve simple quadratic monomial equations and represent the solution as a square root. Work with and perform operations with scientific notation of large numbers. Identify unit rate of change in linear relationships (i.e., slope is the rate of change). Solve linear equations with rational number coefficients, using the distributive property and collecting like terms and equations with infinitely many solutions or no solution. Solve a system of linear equations with integer coefficients using an algebraic strategy. • **4** Write a system of two linear equations including equations whose solutions require expanding expressions	5 - 6	0
		8.EE.6: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.			
	Target D Analyze and solve linear equations and pairs of simultaneous linear equations. (DOK 1, 2)	**8.EE.7:** Solve linear equations in one variable.			
		8.EE.8: Analyze and solve pairs of simultaneous linear equations			
	Target B Work with radicals and integer exponents. (DOK 1, 2)	**8.EE.1:** Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.		5 - 6*	
		8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times = = 1/3^3 = 1/27$.			
		8.EE.3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 × and the population of the world as 7 × , and determine that the world population is more than 20 times larger.			
		8.EE.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.			
	Target E Define, evaluate, and compare functions. (DOK 1, 2)	**8.F.1:** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.	• **2** Identify whether an input/output pair satisfies a function. Compare properties of two linear functions represented in the same way (algebraically, graphically, or in a table). Construct a table to represent a linear relationship between two quantities. Qualitatively describe a graph of a linear function. • **3** Classify functions as linear or nonlinear on the basis of the algebraic representation. Determine the rate of change and the initial value of a function. Know linear equations of the form *y* = *mx* + *b* are functions. Compare properties of two linear functions represented in different ways (algebraically, graphically, or in a table). • **4** Interpret the rate of change and initial value of a linear function in terms of its graph.		
		8.F.2: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.			
		8.F.3: Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.			

	Target G Understand congruence and similarity using physical models, transparencies, or geometry software. (DOK 1, 2)	**8.G.1:** Verify experimentally the properties of rotations, reflections, and translations: **a.** Lines are taken to lines, and line segments to line segments of the same length. **b.** Angles are taken to angles of the same measure. **c.** Parallel lines are taken to parallel lines.	• **2** Construct reflections across an axis and translations of figures in a coordinate plane. • **3** Predict the location of point P after a transformation. Know that sequences of translations, rotations, and reflections on a figure always result in a congruent figure. Construct rotations of figures in a coordinate plane. • **4** Describe the impact of two transformations, including a dilation, on a figure. Identify or draw the relevant right triangle in a three- dimensional figure, given coordinates or a diagram.	5 - 6*	0
		8.G.2: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.			
		8.G.3: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.			
		8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.			
		8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.			
	Target F Use functions to model relationships between quantities. (DOK 1, 2)	**8.F.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	• **2** Identify whether an input/output pair satisfies a function. Compare properties of two linear functions represented in the same way (algebraically, graphically, or in a table). Construct a table to represent a linear relationship between two quantities. Qualitatively describe a graph of a linear function. • **3** Classify functions as linear or nonlinear on the basis of the algebraic representation. Determine the rate of change and the initial value of a function. Know linear equations of the form $y = mx + b$ are functions. Compare properties of two linear functions represented in different ways (algebraically, graphically, or in a table). • **4** Interpret the rate of change and initial value of a linear function in terms of its graph.	2 - 3	
		8.F.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.			
	Target H Understand and apply the Pythagorean Theorem. (DOK 1, 2)	**8.G.6:** Explain a proof of the Pythagorean Theorem and its converse.	**2** Construct reflections across an axis and translations of figures in a coordinate plane. **3** Predict the location of point P after a transformation. Know that sequences of translations, rotations, and reflections on a figure always result in a congruent figure. Construct rotations of figures in a coordinate plane. **4** Describe the impact of two transformations, including a dilation, on a figure. Identify or draw the relevant right triangle in a three-dimensional figure, given coordinates or a diagram.		
		8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.			
		8.G.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.			

Supporting Cluster	**Target A** Know that there are numbers that are not rational, and approximate between by rational numbers. (DOK 1, 2)	**8.NS.1:** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.	**2** Identify numbers as rational or irrational. **3** Convert from fractions to repeating decimals. Use rational approximations of familiar irrational numbers to make numerical comparisons. **4** Approximate irrational numbers between two integers to a specified level of precision.	4 - 5	0
		8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.			
	Target I Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. (DOK 1, 2)	**8.G.9:** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	**2** Identify the appropriate formula for the volume of a cylinder and connect the key dimensions to the appropriate location in the formula. **3** Calculate the volume of a cylinder in direct and familiar mathematical and real-world problems. **4** Solve unfamiliar or multi-step problems involving volumes of cylinders.		
	Target J Investigate patterns of association in bivariate data. (DOK 1, 2)	**8.SP.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	**2** Identify what a linear pattern looks like from a given scatter plot. **3** Describe outliers for a given scatter plot. **4** Use the trend line or line of best fit to make predictions in real-world situations.		
		8.SP.2: Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.			
		8.SP.3: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr. as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.			
		8.SP.4: Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?			
			Total Items for Claim #1	**17 - 20**	**0**

* Indicates 5 – 6 items total in Math CAT for Target B, E, and G.

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 Claim 4: Modeling and Data Analysis	**Claim 2** **Target A** Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. (DOK 2, 3) **Target B** Select and use appropriate tools strategically. (DOK 1, 2, 3) **Target C** Interpret results in the context of a situation. (DOK 1, 2, 3) **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 C, D, E, F, G, H, I**	• **2** Select tools to solve a familiar and moderately scaffolded problem and apply them with partial accuracy. Use the necessary elements given in a problem situation to solve a problem. Apply mathematics to propose solutions by identifying important quantities and by locating missing information from relevant external resources. • **3** Use appropriate tools to accurately solve problems arising in everyday life, society, and the workplace. Apply mathematics to solve problems by identifying important quantities and mapping their relationship and by stating and using logical assumptions. • **4** Analyze and interpret the context of an unfamiliar situation for problems of increasing complexity. Begin to solve problems optimally. Construct multiple plausible solutions and approaches.	**Target A** 2 **Target B, C, D** 1	1 - 2	**8-10**
	Claim 4 **Target A**: Apply problems arising in everyday life, society, and the workplace. (DOK 2, 3) **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) **Target C:** State logical assumptions being used. (DOK 1, 2, 3) **Target D:** Interpret results in the context of a situation. (DOK 2, 3) **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) **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) **Target G*:** Identify, analyze, and synthesize relevant external resources to pose or solve problems. (DOK 3, 4)	**See content standards for Claim 1: Target B, C, F, H, J**		**Target A, D** 1 **Target B, E** 1 **Target C, F** 1 **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:** **Standards: 8.EE.1** **Targets: C, D, E, G, H**	• **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**