

Nevada Mathematics Depth of Knowledge Level Descriptors

Four levels of depth-of-knowledge are used in this analysis. The levels represent a hierarchy based on complexity (rather than difficulty). This difference takes some time to ponder and refine. The hierarchy is based on two main factors: 1) sophistication and complexity, and 2) the likelihood that students at the grade level tested would have received prior instruction or would have had an opportunity to learn the content. Some problems or tasks have a low depth-of-knowledge level because the knowledge required is commonly known and students with normal instruction at that grade level should have had the opportunity to learn how to routinely perform what is being asked.

Level 1 (Recall) includes the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm, reading an uncomplicated data display, or applying a formula. A one-step, well-defined, and straight algorithmic procedure should be included at Level 1. Some key words that could signify Level 1 include “identify,” “recall,” “recognize,” “use,” and “measure.” The action verbs “describe,” “interpret,” or “explain” could be classified at different DOK levels, depending on the complexity of the task.

Level 2 (Skill/Concept) includes the engagement of some mental processing beyond a habitual response. A Level 2 task should require students to make some decisions as to how to approach the problem or task. Some 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. Interpreting information from a simple graph, or reading information from the graph, also is at Level 2. However, interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is at Level 3. Level 2 activities are not limited only to number skills, but may involve probability skills.

Level 3 (Strategic Thinking) requires the use of reasoning, justifying, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is at 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, 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 at 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 deciding which concepts to apply in order to solve a complex non-routine problem.

Level 4 (Extended Thinking) 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. 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 and projects; developing and proving conjectures, making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.

Nevada Mathematics Depth of Knowledge (DOK) Levels for State Assessment Purposes

<u>Sample Level 1 Tasks</u>	<u>Sample Level 2 Tasks</u>	<u>Sample Level 3 Tasks</u>
<ul style="list-style-type: none"> • Recall or recognize a fact, definition, or term. • Apply a well known algorithm and/or formula. • Determine the area or perimeter of rectangles or triangles given a drawing and labels. • Identify a plane or three dimensional figure. • Perform a specified or routine procedure. • Retrieve information from a table or graph. • Solve linear equations. • Represent math relationships in words, pictures, or symbols. 	<ul style="list-style-type: none"> • Interpret information from a simple graph. • Compare and contrast figures. • Provide justifications for steps in a solution process. • Extend a pattern. • Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps. • Translate between tables, graphs, words and symbolic notation. • Select a procedure according to criteria and perform it. 	<ul style="list-style-type: none"> • Interpret information from a complex graph. • Explain thinking when more than one response is possible. • Make and/or justify conjectures. • Develop logical arguments for a concept. • Perform a procedure with multiple steps and multiple decision points. • Formulate a mathematical model for a complex situation. • Provide mathematical justifications.