Standards and Scoring Criteria for Mathematics Tasks

General Rules

The main point here is to estimate the extent to which successful completion of the task requires the kind of cognitive work indicated by each of the four standards: Construction of Knowledge, Disciplinary Concepts, Elaborated Written Mathematical Communication, and Connections to Students' Lives. Each standard will be scored according to different rules, but the following apply to all three standards.

- If a task has different parts that imply different expectations (e.g., worksheet/short answer questions and a question asking for explanations of some conclusions), the score should reflect the teacher's apparent dominant or overall expectations. Overall expectations are indicated by the proportion of time or effort spent on different parts of the task and criteria for evaluation, if stated by the teacher.
- Take into account what students can reasonably be expected to do at the grade level.
- When it is difficult to decide between two scores, give the higher score only when a persuasive case can be made that the task meets minimal criteria for the higher score.
- If the specific wording of the criteria is not helpful in making judgments, base the score on the general intent or spirit of the standard described in the introductory paragraphs of the standard.

	Construction of Knowledge	Disciplinary Concepts	Elaborated Written Mathematical Communication	Connection to Students' Lives
4	N/A	N/A	Analysis / Persuasion / Theory. Explicit call for generalization AND support. The task requires the student to show his/her solution path, AND to explain the solution path with evidence such as models or examples.	N/A
3	The task's dominant expectation is for students to interpret, analyze, synthesize, or evaluate information, rather than merely to reproduce information.	The task clearly asks for understanding and demonstration of the mathematical concepts, ideas, or theories that are central to the discipline.	Report / Summary. Call for generalization OR support. The task asks students, using narrative or expository writing, either to draw conclusions or make generalizations or arguments, OR to offer examples, summaries, illustrations, details, or reasons, but not both.	The question, issue, or problem clearly resembles one that students have encountered or are likely to encounter in their lives. The task asks students to connect the topic to experiences, observations, feelings, or situations significant in their lives.
2	There is some expectation for students to interpret, analyze, synthesize, or evaluate information, rather than merely to reproduce information.	The task seems to require understanding of mathematical concepts, ideas, or theories central to the discipline but the task does not make these very explicit.	Short-answer exercises. The task or its parts can be answered with only one or two sentences, clauses, or phrasal fragments that complete a thought. Students may be asked to show some work or give some examples, but this is not emphasized and not much detail is requested.	The question, issue, or problem bears some resemblance to one that students have encountered or are likely to encounter in their lives, but the connections are not immediately apparent. The task offers the opportunity for students to connect the topic to experiences, observations, feelings, or situations significant in their lives, but does not explicitly call for them to do so.
1	There is very little or no expectation for students to interpret, analyze, synthesize, or evaluate information. Its dominant expectation is for students to retrieve or reproduce fragments of knowledge or to repeatedly apply previously learned algorithms and procedures.	Success in the task can be achieved with a very superficial (or even without) understanding of mathematical concepts, ideas, or theories central to the discipline.	Fill-in-the-blank or multiple choice exercises. The task requires no extended writing, only giving mathematical answers or definitions.	The problem has virtually no resemblance to questions, issues, or problems that students have encountered or are likely to encounter in their lives. The task offers very minimal or no opportunity for students to connect the topic to experiences, observations, feelings, or situations significant in their lives.

Criteria for Scoring Construction of Knowledge

The task asks students to organize and interpret information in addressing a mathematical concept, problem, or issue.

- Consider the extent to which the task asks the student to organize and interpret information, rather than to retrieve or to reproduce fragments of knowledge or to repeatedly apply previously learned algorithms and procedures.
- Possible indicators of mathematical organization are tasks that ask students to decide among algorithms, to chart and graph data, or to solve multi-step problems.
- Possible indicators of mathematical interpretation are tasks that ask students to consider alternative solutions or strategies, to create their own mathematical problems, to create a mathematical generalization or abstraction, or to invent their own solution methods.
- These indicators can be inferred either through explicit instructions from the teacher or through a task that cannot be successfully completed without students doing these things.

Criteria for Scoring Disciplinary Concepts

Student performance demonstrates an understanding of important mathematical ideas that goes beyond application of algorithms by elaborating definitions, making connections to other mathematical concepts, or making connections to other disciplines.

- This standard is intended to measure the extent to which the student demonstrates use and understanding of the mathematical concepts. Prior to scoring the work, the rater should identify what mathematical concepts, if any, a student must use and/or understand to succeed in the task. Low scores may be due to tasks that fail to call for understanding of mathematical concepts.
- A guiding question for this standard is, "Does the student show understanding of the fundamental ideas relevant to the mathematics used in the task?" Correct use of algorithms does not necessarily indicate conceptual understanding of the material. Such an understanding may be demonstrated, for instance, by elaborating upon the concept through definition, or by making connections between the core concept and other related ones.
- If the work is not shown, correct answers can be taken as an indication of conceptual understanding, if it is clear that the task or question requires a conceptual understanding in order to be completed successfully.

Criteria for Scoring Elaborated Written Mathematical Communication

The task asks students to elaborate on their understanding, explanations, or conclusions through extended writing.

- Consider the extent to which the task requires students to elaborate on their ideas and conclusions through extended writing in mathematics.
- Possible indicators of extended writing are tasks that ask students to generate prose (e.g., write a paragraph), graphs, tables, equations, diagrams, or sketches.

Criteria for Scoring Connection to Students' Lives

The task asks students to address a concept, problem or issue that is similar to one that they have encountered or are likely to encounter in daily life outside of school.

- Consider the extent to which the task presents students with a mathematical question, issue, or problem that they have actually encountered or are likely to encounter outside of school. Estimating personal budgets would qualify as a real world problem but completing a geometric proof would not.
- Certain kinds of school knowledge may be considered valuable in social, civic, or vocational situations beyond the classroom (e.g., knowing basic arithmetic facts or percentages). However, task demands for "basic" knowledge will not be counted here unless the task requires applying such knowledge to a specific mathematical problem likely to be encountered beyond the classroom topic to their lives.

Adapted from material developed by Quest HS, Humble, TX,
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