

Example 1: Math Problem

The following problem is one of several given to students to assess problem solving in math. Student work is assessed using a rubric (not included here) that covers mathematical understanding, problem-solving processes, and communication.

A group of 8 people are all going camping for 3 days and need to carry their own water. They read in a guidebook that 12.5 liters are needed for a party of 5 people for 1 day. Based on the guidebook, what is the minimum amount of water the 8 people should carry all together? Explain your answer.

Source: Used on various assessments in Oregon and Idaho.

Example 2: Motorized Vehicle—High School

This is a problem in applied physics. It is a culminating project to assess knowledge of motion, written and oral communication proficiency, and reasoning.

Design and construct a motorized vehicle that can produce at least two simultaneous motions in different directions to accomplish an action. When your work is done, you will demonstrate your device and explain how it works. In addition, you will be asked why you made certain design decisions, relying on your understanding of physics concepts. Finally, you will also be asked how well your device worked and to explain how you might modify your vehicle to make it better. The attached criteria (here not reproduced, but given to the students) will be used to judge your work.

Source: Abstracted from Dorothy Bennett, Assessment and Technology Videotape, Center for Technology in Education, Bank St. College of Education, 610 W. 112th St. New York, NY 10025.

Example 3: Create a Flag—Middle School

The following is a task, as given to students. There is no additional explanation.

As a group, you have been asked to submit a design for the flag for the new Pacific Island nation of Koluhra.

Koluhra is located in the Caroline Islands of Micronesia approximately 400 miles SE of the state of Yap at 3 degrees N. latitude, and 147 degrees E. longitude.

The inhabitants of this new nation have migrated over time from outer islands of three surrounding island nations following a series of typhoons. Traditional chiefs have formed

a governing body and share a vision of unity among the people upheld by extended family relationships. They hope to carefully expand their economy around ecotourism.

Using what you know about the islands of the western Pacific, the information provided above and your joint creativity, design a flag that can serve as a visual symbol of Koluhran identity. You will need to prepare to exhibit your design to the council of chiefs and explain how each element of the flag contributes to the identity of Koluhra.

Source: Abstracted from Regional Educational Laboratories (1998), Toolkit98, Appendix B, Sample B5, contributed by Kathy Busick.

Example 4: Ken Griffey, Jr.—Grade 3

This is one of a series of problems. The goal is to match the tasks on the state assessment with the instructions in the table. Student responses were scored on correct answer, solving the problem in more than one way, checking the answer, and drawing a picture.

The problem:

Ken Griffey, Jr. hit 36 home runs in 9 games. How many home runs did he hit in each game?

Writing Mathematics Write to help explain your best thinking using words, numbers, or pictures.	
Investigation	<p>Did I understand the problem?</p> <p><i>Suggestion:</i> Read the problem carefully. Decide what you're looking for. Find the important information.</p>
Planning	<p>Did I make a plan to solve the problem?</p> <p><i>Ideas:</i> guess & check . . . draw a picture . . . use logic look for a pattern . . . make a model . . . act it out work backward . . . use easier numbers make an organized list . . . make a table or chart write a number sentence . . .</p>
Solution	<p>Did I carry out my plan?</p> <p><i>Think again:</i> Check any arithmetic you may have done. Make sure you used all the important information. Decide if your answer makes sense. Write your answer in complete sentences.</p>

Example 5: Sow Bugs—Grades 4–6

This task was one of three given to students to assess science process skills.

Students receive five sow bugs, a round dish to contain them, a bright light and strips of dark cardboard to create regions of light and dark, filter paper, a spray bottle for creating damp regions, and a stopwatch. The students are to answer the following questions:

- Do sow bugs prefer light or dark environments?
- Do sow bugs prefer damp or dry environments?
- Do dampness and amount of light in combination make a difference in sow bug preferences?

Scoring is procedure based (task specific). For each experiment, observers focus on the method used to solve the problem, the adequacy with which conditions are manipulated, the measurement strategies used to determine the results, and the correctness of the solution generated.

Source: Adapted from "On the Stability of Performance Assessments," by M. A. Ruiz-Primo, G. P. Baxter, & R. J. Shavelson, 1993, *Journal of Educational Measurement*, 30, pp. 41–51; "Performance Assessments: Political Rhetoric and Measurement Reality," by R. J. Shavelson, G. P. Baxter, & J. Pine, 1993, *Educational Researcher*, May, pp. 22–27.

Example 6: Fruit—Grade 7

The following is a seventh-grade math problem. Scoring is based on the correctness of the answers and the steps used to solve the problem.

Lisa put some fruit in a large bowl for her friends. The bowl had twice as many apples as oranges, and half as many pears as oranges. Altogether, there were 14 pieces of fruit in the bowl.

- How many apples did Lisa put in the bowl?
- How many oranges?
- How many pears?
- Explain or show how you found each answer.

Example 7: The Car Problem—Post High School

The following problem was given to students to determine their ability to solve problems. It was scored for the correctness of each step.

From the classified section of a newspaper, select one particular brand and model of automobile that appears several times. Collect data on the age (number of years old) of the vehicle versus the asking price. You should have at least 8 points.

- a. Plot the data you have gathered. Carefully label your graph.
- b. Draw an “eyeball fit” line through the data. (You next task will be easier if the line goes through two of the data points.)
- c. Write an algebraic linear model to describe the line you have drawn.
- d. Interpret the meaning of the slope in your model.
- e. Interpret the meaning of the vertical-intercept of your model. (Include the numerical value and the units.)
- f. In there are other data points that do not seem to fit the overall linear pattern of the other data, try to explain why.

Source: Collected from a mathematics teacher at Mt. Hood Community College, approximately 1990.

Example 8: Math Portfolio—Grades 4, 8

Students are asked to assemble a portfolio that demonstrates their mathematical ability. Each portfolio should contain 10-20 selections.

5-7 of these should be “best pieces” and must include: 1 puzzle, 1 investigation, 1 application, and no more than 2 pieces of group work.

- The student can select other pieces that demonstrate ability.
- The student should write a letter to the evaluator that describes what he or she has chosen for his or her portfolio and what it shows about the student.

The portfolios are assessed using rubrics that cover the following:

Problem Solving: How well does the student understand the problem, how does the student solve the problem, why does the student solve it the way she or he did, and what observations, connections, generalizations does the student make about the problem?

Communication: What terminology, notation, symbols does the student use to communicate his or her math thinking, what representations (graphs, charts, tables, models, diagrams, pictures, manipulatives) does the student use, how clear is the student's communication of mathematical thinking and problem solving?

Source: Abstracted from Vermont State Department of Education, Portfolio Assessment, about 1984.