



**& More**

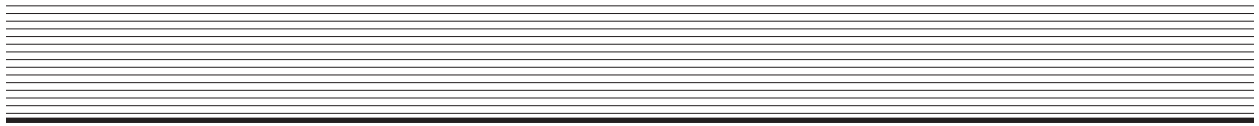
**FOR GRADES 1-2**

Barbara J. Dougherty

University of Hawai'i at Mānoa

**CR Curriculum Research  
DC & Development Group**

providing quality educational programs and  
services for preschool through grade 12



# ***The “Write” Way Mathematics Journal Prompts & More***

## **FOR GRADES 1–2**

## **Curriculum Research & Development Group**

Donald B. Young, Director

Kathleen Berg, Associate Director

Lori Ward, Managing Editor

Cecilia H. Fordham, Project Manager

Book design: Darrell Asato

Cover design: Byron Inouye

Published by Curriculum Research & Development Group

©2006 by the University of Hawai'i

ISBN-10 1-58351-076-1

ISBN-13 978-1-58351-076-6

eISBN 978-1-58351-126-8

Printed in the United States of America

All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, or by any storage or retrieval system, without permission in writing from the publisher except as indicated in the material.

Distributed by the  
Curriculum Research & Development Group  
University of Hawai'i  
1776 University Avenue  
Honolulu, Hawai'i 96822-2463

Email: [crdg@hawaii.edu](mailto:crdg@hawaii.edu)

Website: <http://www.hawaii.edu/crdg>





---

# Journal Writing

Journal writing can be structured to give teachers cohesive and comparable information about students and their thinking while challenging them through contextual situations. A structure for journal writing includes prompts that focus on (1) mathematical content, (2) mathematical processes, and (3) student attitude or affect. Journal prompts give situations or questions to which students respond. Responses may include words, pictures or drawings, or symbols. Students are encouraged to support their ideas and to clearly explain what they mean. They can give specific examples as part of their explanations or use counterexamples.

Content prompts relate or connect topics within and outside of mathematics, targeting important or meaningful concepts and skills. They can also provide situations that focus on areas where students often have misunderstandings or misconceptions. The responses to the prompts give teachers (and students) insight into how a student has interpreted a mathematical idea.

Process prompts promote the awareness of how students solve or approach problems or algorithms. The responses to these prompts can give insight into students' preferences for problem-solving strategies or algorithms and into how they learn or remember. As students become aware of how they learn and solve problems, they grow more confident in approaching new or novel problems.

Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. Students' responses allow teachers to assess how positive attitudes about mathematics and mathematicians are developing in the classroom environment.

## Extended Problem-solving Tasks

Extended or expanded problem-solving tasks provide opportunities for students to explore and solve problems that require novel solution approaches. For this purpose, problem solving is defined as confronting a problem that does not have an obvious solution or solution path. In most cases, a non-routine solution method (or combination of methods) is required such as making a list, drawing a diagram, working backwards, guessing-and-testing, or creating a table.

Extended problem-solving tasks require more time and thought to solve than routine problems. Students draw on their previous knowledge and experiences to reason through the problem. Because their thought processes will be more complex, writing an expanded solution is an important part of communicating their methods or processes to others. Writing a response to an extended problem-solving task also helps students create a solution process as they clarify what the problem is asking, what information is given in the problem, and what solution methods would be appropriate.

Many students believe problem solving to be a linear process. That is, they read a problem, think of a solution method, solve the problem, and check their answer. Problem solving is more complex. It often requires re-reading a problem or abandoning one solution method for another.

---

# Assessment Tasks Requiring Writing

Assessing student understanding can be done in a variety of ways including journal writing, homework problems, problem-solving write-ups, quizzes, and tests. Any assessment should encompass at least three types of tasks:

(1) problem solving, (2) conceptual understanding, and (3) skill acquisition.

Of the three types of assessment tasks, skill acquisition is most often assessed. These tasks would include solving equations and inequalities or using formulas by primarily symbol manipulation. Students often apply an algorithm that may or may not convey their understanding.

Items that are designed to assess students' conceptual understanding or ability to problem solve can provide a rich means by which students demonstrate their thinking and interpretations of concepts through expanded responses. The inclusion of these types of items link assessment with classroom practice. If students are required in mathematics classes to explain their thinking in class discussions or on their homework papers, it is important that assessments also include similar tasks. Likewise, if state assessments include self-constructed response items, students will develop skill in responding to such items when these types of tasks are regularly included on a daily basis as well as on assessments.





---

## . . . and more

- ✎ There are 12 extended problem-solving tasks. Each task requires more time to solve than one class period. Students often provide the best solutions if they are given 10 days in which to solve it. The teacher may decide to use one of these every 3 weeks or so.
- ✎ In some cases, teachers may assign the tasks for the entire class to work individually. These tasks also give teachers and students the opportunity to use pair or group problem solving. Regardless, it is important that students write their responses in a way that a reader can see the flow of their thinking and understand the solution method or path that they used.
- ✎ It is recommended that students do extended problem solving on a regular basis. This practice supports their development of problem-solving strategies and boosts their confidence to solve complex problems.
- ✎ For each problem-solving task a solution has been given. However, there are multiple methods to solve each problem. Teachers should be open to creative ways that students may approach these problems.
- ✎ There are 10 assessment items included here. . These items represent a conceptual approach to a particular mathematical topic. There should be no more than one of these items on a chapter test. If used independent of the chapter quizzes or tests, however, it is possible to use more than one. Additionally, any of the content or process journal prompts can be used on formative or summative assessments in a similar manner.
- ✎ It is important to recognize that students should have experience with talking and writing mathematics daily in order for the use of these assessment items to be representative of student understanding. If a teacher uses a lecture-based approach, some of these items may need alteration to allow for optimal responses from students.

---

# Evaluating Students' Responses

Students tend to give the writing more thought if it is to be scored. One method used was to score the responses on content rather than on grammar and spelling. An essay grading method was used. By reading two or three papers to get a feel for students' responses these first papers formed the baseline for scoring other papers. This method, however, did not provide students a guideline for writing in advance.

When teachers use rubrics and metrics, however, scoring guidelines can be provided in advance. A rubric establishes qualitative levels that define what characteristics a response has or what criteria it meets. The qualitative levels are not used as points. On the other hand, a metric is a point system. The levels of a metric have specific criteria associated with each point value. The same criteria may be used for either a rubric or a metric system. The difference is in whether or not points or qualitative levels are established for the response.

There are many ways to create a rubric or metric. Teachers can develop one alone, or students can work with the teacher to develop a rubric or metric specific to their class or to the task. Sample rubrics and metrics, developed with students' participation, follow on the next page.

Although grammar and punctuation are not usually scored, students should communicate their ideas in ways that are understandable. Some students may use drawings, tables, charts, or other means to convey their ideas. They should be encouraged to use whatever ways they need to make their ideas clear.

As writing tasks are used, excerpts can be taken from students' papers to illustrate qualities that you consider important. Both high- and low-quality responses can be used to show students the comparison with rubric or metric criteria. Of course, authorship of whatever responses are selected should be kept anonymous.

Rubrics or metrics to score the problem-solving tasks as extended types or as assessment items can be developed for each individual task or created as a general guide for student performance. The rubrics or metrics that follow can also be adapted to serve as a generalized set of criteria to guide students' solution approaches. If rubrics or metrics are being used by the entire mathematics department, it may be appropriate to have department-wide discussions to agree upon criteria. This will provide a means by which to motivate consistent and cohesive student work across grades, courses, and teachers.

With any form of writing and any type of rubric or metric, students can self-evaluate their responses or conduct peer evaluations. This allows you to see if students truly understand the criteria outlined in the rubric or metric. This activity also requires students to think at a much higher level as they analyze critically others' work .

## General Metric

### 4 points The student's work includes—

- ✎ completed prompt or an answer to the question posed
- ✎ support for statements made by using either examples or counterexamples
- ✎ ideas clearly communicated to the reader
- ✎ legible writing, drawings, pictures, charts or tables, and diagrams
- ✎ accurate mathematics or information

### 3 points Omission of one criterion from level 4

### 2 points Omission of two criteria from level 4

### 1 point Omission of three criteria from level 4

### 0 points Omission of more than three criteria from level 4

## Three-level Rubric (or Metric)

### The student's work shows a response that—

#### Exceeds standard

- ✎ addresses the question raised in the prompt
- ✎ has correct or accurate mathematics
- ✎ is legible
- ✎ has support or justification for any statements made
- ✎ makes sense to the reader

#### Meets standard

- ✎ addresses the question raised in the prompt
- ✎ has some correct or accurate mathematics
- ✎ is legible
- ✎ does not support or justify some of the statements made
- ✎ makes sense to the reader

#### Below standard

- ✎ does not address the question raised in the prompt
- ✎ has incorrect or inaccurate mathematics
- ✎ is not legible
- ✎ does not support or justify statements made

## Five-level Rubric (or Metric)

### 4 The student's work shows a response that—

- ✎ addresses the question raised in the prompt
- ✎ has correct or accurate mathematics
- ✎ is legible
- ✎ has support or justification for any statements made
- ✎ makes sense to the reader.

### 3 The student's work shows a response that—

- ✎ addresses the question raised in the prompt
- ✎ has correct or accurate mathematics
- ✎ is legible
- ✎ does not have fully justified or supported statements
- ✎ makes sense to the reader

### 2 The student's work shows a response that—

- ✎ addresses the question raised in the prompt
- ✎ has some incorrect or inaccurate mathematics
- ✎ is legible
- ✎ does not have justified or supported statements
- ✎ is somewhat clear to the reader

### 1 The student's work shows a response that—

- ✎ addresses the question raised in the prompt
- ✎ has incorrect or inaccurate mathematics
- ✎ is partially legible
- ✎ does not have justified or supported statements
- ✎ does not make sense to the reader

### 0 The student's work shows a response that—

- ✎ does not address the question raised in the prompt
- ✎ has incorrect or inaccurate mathematics
- ✎ is not legible
- ✎ does not make sense to the reader

---

# Implementing Journal Writing in Your Classroom

- ✎ To begin using writing in your classroom, you will need to make sure your students understand your expectations for writing. The following offers one method for helping students learn what is meant by *writing in mathematics*.
- ✎ Share with students the rubric or metric you will be using. You may opt to create a rubric or metric with your students rather than creating one yourself. Make copies of the rubric or metric for students to keep in their notebooks. Post one copy in the classroom for easy reference.
- ✎ Give students a practice prompt to write. If it is used as a warm-up, allow about 6 minutes for them to respond. The practice prompt can be any type, but the rubric or metric may work better with a content prompt. Select one that you feel all students in your class can attempt.
- ✎ Have students compare what they wrote with their partner or table mates. They should check the rubric or metric. Have students focus on 3 things they could do to improve their writing to the next higher level. If their writing already includes all the indicators for the top level, ask them to write another question that this prompt made them think about.
- ✎ Allow 3 minutes for students to correct or revise their work. They should strive to reach the top two levels of the rubric or metric.
- ✎ Collect the work. Score it with your rubric or metric. However, to allow students time to learn to meet your expectations, you may not want to record the score yet.
- ✎ For the next several days, whether you assign prompts as a warm-up or for homework, allow students time to revise or correct their work. You should stress that they should strive to reach the top two levels. Repeat this phase as often as needed to help students understand your expectations for their writing.
- ✎ If possible, show students samples of other students' writing. A sample of student writing in grade 2 follows. Use this sample to illustrate what you mean by your criteria in the rubric or metric.
- ✎ Note that the misspellings have been left in the writing sample. If you use this sample with your class, you will need to decide how to handle that component of the writing. While the student in this writing sample does share some characteristics of the two shapes, he does not get at the essence of the question. This response could be used with the whole class to determine what a good response would contain.





---

# Content Prompts

## Number Sense, Properties and Operations with Real Numbers

- 1. Sam found a number line. He wanted to put 47 on the number line. Where do you think it belongs? Show where you think 47 belongs. How did you decide where to put it?**

Students should indicate a placement close to 40, with a written or oral explanation. You can decide an appropriate placement but you should consider a point a bit to the right of 40. The numbers on the number line can be changed as well as the number students are to locate.

- 2. Jack said, “I have 5 base-ten blocks to make a number. It is the smallest amount of blocks needed to make this number.” What number do you think Jack made? Explain your thinking. Draw the blocks he used.**

This prompt has multiple answers. Some students respond that it could be 5 (5 unit blocks), 50 (5 ten blocks), 14 (1 ten and 4 units), 500 (5 hundred squares), 104 (1 hundred block and 4 units) and so on. Students should draw the blocks they think Jack used. Encourage them to find multiple answers.

- 3. Sara rounded a number to 100. Find a number that Sara could have used. Explain why it could be rounded to 100. Find at least two more numbers that could be rounded to 100.**



There are multiple responses. Some students may select a number smaller than 100 but larger than 50 while other students will look for a number larger than 100 but smaller than 150. Students should include an explanation.

- 4. Mick asked his teacher, “What do we use a number line for?” What do you think Mick’s teacher told him? Be specific.**

Responses should indicate different uses of number lines. Watch for appropriate use as models for operations. Use students’ comments as part of a class discussion on operations. Some students may comment on using a number line for measurement or for determining the relationship between or among numbers that are unequal.

- 
- 5. “I think subtraction is commutative,” said Randy. “I don’t agree,” said Brenna. Who do you agree with? Use examples to support your response.**

Students should agree with Brenna. Subtraction is not commutative. Students’ responses may include examples that show that changing the order of the minuend and the subtrahend gives differences that are not the same. Given the developmental level, students may not use integers. It may also be appropriate if students draw pictures of the concrete models or use the number line to support their response.

- 6. Lee found a number line like the one shown. Where on the number line would you find a number larger than 27? How do you know?**



Numbers larger than 27 are found to the right of 27. Students may give examples to illustrate the correctness of their response.

- 7. Carla, a second grader, has 850 M&Ms. Can she hold all of them in her hand? Why? If not, how many do you think she can hold? Support your answer.**

Answers will vary. Check for reasonableness of the number of M&Ms that she can hold in her hand. Some reasonable responses could include any number of M&Ms less than 30.

- 8. Thomas said, “802 is greater than 820.” Robert said, “No, it’s not.” Who is correct? Why do you think that person is correct?**

Students should show that Robert is correct. They may “prove” he is correct by drawing or showing with manipulatives, such as base-ten blocks. The numbers in the problem can be changed to be smaller or larger than 802 and 820.

- 9. Sara asked, “What’s the largest number you’ve ever used?” What would you tell Sara? Be specific. Describe how you used the number.**

Answers will vary. Students’ responses often include everyday contexts that require large numbers.



---

**10. Casey wrote  $5 + 6 = 11$  on the board. What does “=” mean??**

Responses should show some representation of equivalence rather than indicating that 11 is the answer. Responses that focus on 11 being the answer to the addition problem typically focus on the equal sign as an operator rather than a symbol that indicates relationships. Students may show that two sets, one containing five items and one containing six items, can be combined to have a set of eleven items.

**11. Amy wrote, “ $18 < 28$ .” Larry asked, “What does the ‘<’ mean in your statement or expression?” What should Amy tell Larry?**

Responses should indicate that 18 represents a lesser amount or quantity than 28. Encourage students to generalize or make statements about the use of the inequality signs to show unequal amounts.

**12. Seth said, “I can draw two sets of blocks that are equal in length.” Jena said, “I can draw two sets of blocks where one set is longer in length than the other one.” Draw a set of blocks that Seth has described. Show how they are equal. Draw another set of blocks that Jena has described. Show how they are not equal.**

Answers will vary. Their drawings can be used to discuss greater than, less than, and equal to in reference to the symbols used to show those relationships and to using length as a way to show equality and inequality.

**13. Josh said, “I was fifth in line and I was also last in line.” Can this be true? Why or why not?**

It can be true if there are only five people in line. Students may explain this with a drawing. The numbers can be changed to reflect other contexts. Students can explore the idea of being first AND last in line.

**14. “Can you draw a picture that shows you are the eighth person in line?” asked Dori. What picture would you draw? Show how you know where the eighth person is in line.**

Answers will vary. A drawing should show at least 8 people in line.

**15. Jenny said, “I have seven coins that equal 25¢.” What coins do you think Jenny has? Draw the coins and show why they equal 25¢.**

Jenny has five pennies and two dimes. Students' responses may show a drawing of the seven coins but they should also indicate why they equal 25¢.

- 
- 16. Sam said, “I have 10 coins.” Sal said, “I have 12 coins.” “Well,” said Sam. “I have more money than you do.” Can Sam be correct? Why or why not?**

Answers will vary. For example, Sal could have 12 pennies while Sam has 10 dimes. Students should notice that the number of coins does not indicate the value or amount of money.

- 17. “I will pay you to make a word,” said Trina. “Every consonant is worth 50¢ and every vowel is worth 10¢. CAT would be worth \$1.10 or 110¢.” Make any word and show how much you will be paid. Then, make a word worth 120¢.**

Answers will vary. For example, students could make the word PLAY, which would be worth \$1.60 or 160¢. For 120¢, accept any word with that total. One example is FEET.

- 18. Write a word problem that uses money and has a solution of 28¢. Show how to solve the problem.**

Answers will vary. Check the problem’s context for appropriate use of money concepts. Share particularly good problems with the class as a problem-solving task.

- 19. “I have counted all my money,” said Erin. “I have two quarters, one dime, three nickels, and 11 pennies.” How can Erin trade her money so that she has the least number of coins? Explain your answer.**

Erin can trade her money into three quarters, one nickel, and one penny. She has 86¢ total. Students should show the process they used to arrive at their answer. Many ways are possible such as adding up all amounts first and then finding the coins needed. Or students may “trade as they go,” showing how the trades are done.

- 20. Mr. I. M. Money has decided to give \$100.00 to a student who can spend it wisely. Write a letter to Mr. Money and explain how you would spend the money. Be sure to explain why you would spend it that way.**

Answers will vary. Make sure that responses are reasonable. This activity can be expanded to language arts class. The prompt can be changed to have students draw a picture of how they would spend the money if you are working with a lower-elementary class.

---

**21. Glen made a riddle about a coin.**

**I have a coin that can be traded for 25 pennies. What coin is it?**

**Make a riddle or a puzzle about a coin or coins. Show the answer.**

Answers will vary. This is a good prompt to use in class. Students can share with other groups or individuals.

**22. Pat asked, “What is a fraction?” What do you think? Support your answer with examples of fractions.**

Answers will vary depending on how your class has discussed fractions. Some students may draw an area region and show it divided into equal-sized parts. Others may talk about the symbolic representation of a fraction. Watch student responses for an indication of a relation of parts to wholes.

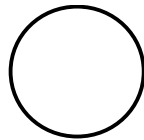
**23. Mason dropped spaghetti sauce on his math paper. What do you think is under the sauce he dropped? Why?**

$$32 - \text{[sauce]} = 14$$

Students should indicate that 18 must be under the spaghetti sauce. Their reasoning can vary. Intuitively, students may say that the number under the spaghetti sauce has to be 14 less than 32. Thus one solution method is to subtraction 14 from 32 to get 18. Fact teams or families could be used to get the missing number. Other students may work backwards to find the subtrahend. Manipulatives may also be used to find the answer.

**24. Garth cut a chocolate pie so that he and three friends could each have an equal-sized piece. Draw how he cut the pie.**

Answers will vary. Allow responses that show four equal-sized pieces as well as responses that show more than four pieces. Regardless of the number of pieces, all of the pieces should be the same size.



**25. Darron’s calculator is broken. It doesn’t always add correctly. He has difficulty deciding if a problem is done correctly. He added  $43 + 113$ . His calculator showed a sum of 543. Do you agree? Why or why not?**

Students should disagree because an estimate of the sum is closer to 150. Some students may show you how to solve the problem or they may use an estimation strategy such as front-end or compatible numbers. Others may note that one addend is 43 and the other is over 100. Thus the sum must be smaller than 200.

- 
- 26. Beau asked, “How are addition and subtraction related?” Eli said, “I can show you how they are related.” What do you think Eli showed Beau? Be specific.**

Answers will vary. Some students may comment on the ‘inverseness’ of the two operations with the example that addition can undo subtraction, or vice versa. Others may indicate that you can use addition to solve subtraction problems. For example, in the problem  $8 - 5$ , you can ask yourself, ‘what added to 5 will give you 8?’ as a means to solve the problem. Other students may show a fact team or a fact family as part of their response. Be sure they explain their answers.

- 27. Write a word problem that uses or shows one-half of something.**

Answers will vary. Check problems for an appropriate context for one-half of a thing or a group of things. As an extension, you can ask students to share their word problem with the class. Have other students or the class solve the problem. For another extension, have students explain what one half of something means. Students’ models may present different representations of one-half.

- 28. Jessica looked at the equation and said, “What number should go in the blank?”**

$$6 + \underline{\quad} = 15$$

**Find the missing number. Describe how you found the answer. Or draw a picture that shows how you found the answer.**

The missing number is 9. Students should describe or show their process. Watch for responses that use inverse operations, counting on or counting up, counting down, or a fact family. Their processes would be interesting to discuss in class. Other numbers can be substituted in the number sentence to fit the level of your class.

- 29. Emily had to find the missing number in this number sentence:**

$$17 - \underline{\quad} = 9.$$

**Find the missing number. Describe how you found the answer. Or draw a picture that shows how you found the answer.**

The missing number is 8. Students should describe or show their process. Watch for responses that use inverse operations, counting on or counting up, counting down, or a fact family. Their processes would be interesting to discuss in class. Other numbers can be substituted in the number sentence to fit the level of your class.

- 
- 30. Ella asked “What does addition mean?” What would you tell Ella? Use specific examples or drawings to show what addition means.**

Answers will vary. Responses should describe one of the models for addition such as combining sets to form one large set.

- 31. “I don’t have enough M&Ms to share with all of my seven friends,” said Chuck. “I have 25 M&Ms.” How many more M&Ms does Chuck need so that all 8 people will get an equal amount? Explain your answer.**

Chuck needs seven more M&Ms. Students should explain their answer and process.

- 32. Brad asked, “What’s the largest number of digits possible in the sum of a one-digit number and a two-digit number?” What would you tell Brad? Be sure to provide an argument that is convincing.**

Students should indicate that the maximum number of digits in the sum can be three. They may provide multiple ways of giving a rationale for their response. One way is to use  $99 + 9$  as a means to determine the maximum number of digits. This prompt can be changed in terms of the number of digits and the operation.

- 33. Noni asked, “What does the digit 2 represent in the number 26?” What would you say to Noni? Describe.**

The 2 represents 20. Some students may say it represents 2 tens. As you move to multi-digit numbers, the focus on the value of the digits in specific place values is important.