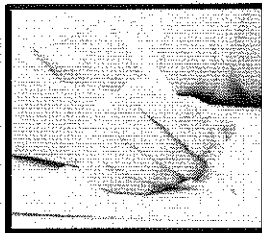


Making Things Write: How to Infuse Quality Math Writing

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AGENDA

Considering "writing" in math

Current curriculum calls

Holistic implementation of writing

Characteristics and types of mathematical writing

Tips to adapt curriculum resources

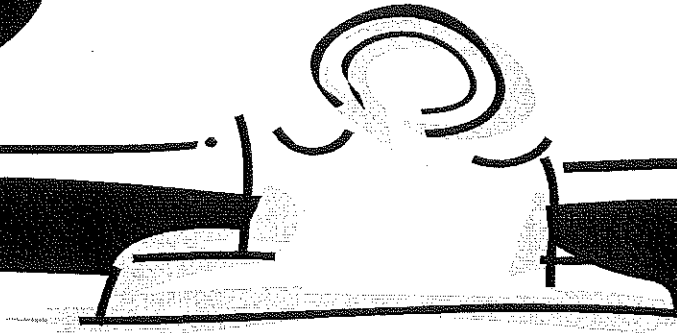


Student Mathematician: _____

Date: _____



Mathematician's Journal



2. Miranda has made a discovery. She claims that all squares are rectangles! Do you agree or disagree? Explain your answer.

Lined writing area for the student's response.

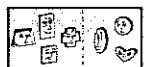
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Your Thoughts and Questions

Use the back!

Need more room?



Unit: Gavin, M. K., Casa, T. M., Chapin, S. H., & Sheffield, L. J. (2012). *Exploring shape games: Geometry with Imi and Zani*. Dubuque, IA: Kendall Hunt.

Student author: Grade 1 student participating in the field test

CCSS-M Content Standard: "1.G, Reason with shapes and their attributes. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes" (CCSSI, 2010, p. 16).

1 prominent CCSS-M Mathematical Practice: 3 Construct viable arguments and critique the reasoning of others.



I want to win my Lingo game! I rolled a 4. Put an X to show me where to put my next chip. Why should I put it there?

L	I	N	G	O

Dear Zani,

You should put your chip on the quadrilateral marked with an X.

You should put it there because both of those shapes have 4 sides, and it will give you four in a row. Now you can win!

Your math friends,

Unit: Gavin, M. K., Chapin, S. H., Dailey, J., & Sheffield, L. J. (2006). *Unraveling the mystery of the moli stone*. Dubuque, IA: Kendall Hunt.

Student author: Grade 3 student participating in the field test

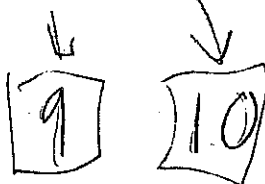
CCSS-M Content Standard: "3.NBT, Use place value understanding and properties of operations to perform multi-digit arithmetic. Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9×80 , 5×60) using strategies based on place value and properties of operations" (CCSSI, 2010, p. 24).

1 prominent CCSS-M Mathematical Practice: 7 Look for and make use of structure.



How many different two-digit numbers are possible if the two digits cannot be the same and the first digit cannot be zero? How might you figure this out without writing down all the possibilities?

The answer is 81 because as shown on the bottom of the page I had to figure out how many digits can go in the ones place which is 10 and in the tens place which is 9. I did 9×10 which equalled 90. Since you can not have any number with the same 2 digits, you have to minus 9. The answer is 81.



1	11	9	99
2	22		
3	33		
4	44		
5	55		
6	66		
7	77		
8	88		

Your Thoughts and Questions

Unit: Gavin, M. K., Chapin, S. H., Dailey, J., & Sheffield, L. J. (2007). *Factors, multiples, and leftovers: Linking multiplication and division*. Dubuque, IA: Kendall Hunt.

Student author: Grade 4 student participating in the field test

CCSS-M Content Standard: "4.OA, Gain familiarity with factors and multiples. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number" (CCSSI, 2010, p. 29).

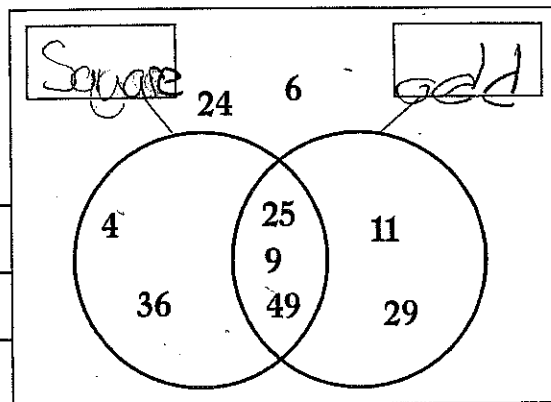
1 prominent CCSS-M Mathematical Practice: 2 Reason abstractly and quantitatively.

Mathematician's Journal

#2. You see the following Venn diagram with several numbers placed in the sections but the labels are blank.

A. Try to figure out what the blank labels must be and write them in the boxes.

B. Explain your thinking. Use your number cards and Venn diagram loops to help.



We think that the Venn Diagram on the left is square

numbers because ~~two~~ ^{two} equal factor for example for ^{made} $2 \times 2 = 4$

On the right side 11 is odd because if you count by

2 you won't land on the intersection between the



Your Thoughts
and Questions

Square and odd has
the number 25, 9, 49. Are

odd and square because

$$5 \times 5 = 25, \quad 3 \times 3 = 9, \quad 7 \times 7 = 49.$$

And 25 is odd because
the 5 in the ones place
is odd. So that means it
is square and odd. The out
side of the circle are 24 and
6. 6 and 24 are not in the
circle because it doesn't have
two equal factors or it's
not odd because if you
count by 2's you will
land on it.

Q

any Questions.

Mathematical Argumentation Writing Strategies
 Compiled by Madelyn W. Colonnese & Tutita M. Casa
 NCTM National Conference, April 16, 2015

Share Conventions of Written Mathematical Arguments	Encourage the Use of Representations	Encourage the Use of Mathematical Vocabulary	Use Prompts That May Press Students to Write a Mathematical Argument
<ul style="list-style-type: none"> • Writer's role (think about the q, write the answer, explain why using words and possibly other representations) • Use the talk frame (e.g., "This is how mathematicians would write what you said") • Share <u>models</u> of writing, and critique them • Share <u>samples</u> of writing, and critique them • Provide written and oral feedback 	<ul style="list-style-type: none"> • Use the talk frame (e.g., "This is how mathematicians would show what you mean.") • Have students critique one another's use of representations • Compare and contrast different forms of representations • Have students "work backwards" – give a representation and ask what problems they can connect it with • Create a poster/display and cumulatively add representations 	<ul style="list-style-type: none"> • Model their appropriate use • Introduce terms when "needed" • Encourage student use • Use an interactive word wall: <ul style="list-style-type: none"> ▪ Categorize words ▪ Create connections between words ▪ Web the words • Incorporate vocabulary activities: <ul style="list-style-type: none"> ▪ Confession videos ▪ Wanted posters ▪ Riddles ▪ Journals ▪ Centers ▪ Word bank for the day ▪ Glossaries ▪ Digital Glossaries 	<ul style="list-style-type: none"> • Multiple solutions, common misconceptions • Student A thinks X. Do you agree or disagree? Why? • Student A thinks X. Student B thinks Y. Who do you agree with, and why? (Sometimes A right, sometimes B right, sometimes both right, sometimes neither; from Bostiga, Cantin, Fontana, & Casa, in press)

Tips to Press Students to Write Mathematical Arguments

Compiled by Tutiita M. Casa & Madelyn W. Colonnese
NCTM National Conference, April 16, 2015

Possible Task Modification	Notes
<p>Add in a writing support specific to argumentation.</p> <ul style="list-style-type: none">• "Write a mathematical argument to answer the following question"• "Write your claim"• "Include evidence"• "Consider your warrants"• "Convince a classmate"• Add in a frame (e.g., "I think ____ because ____")	
<p>Press students to explain why.</p> <ul style="list-style-type: none">• Do not use simply "explain"• Add: "Explain why"• Start the prompt with "why"• Use "explain your thinking"• Address the second portion of MP 3:<ul style="list-style-type: none">○ "Do you agree? Why?"○ "Do you agree or disagree? Why or why not?"	
<p>Skip procedural questions and eliminate the repetitive question</p> <ul style="list-style-type: none">• <u>Not</u>: "Solve the problem. Explain." or "Show how you figured this out."• <u>Instead</u>: "How do you know your thinking is correct?" "Show how know you are right."	
<p>Push past procedural explanations</p> <ul style="list-style-type: none">• Present a part of a procedure and have students explain why• "What have you learned in class to defend your reasoning?"• "How will you use ____ to explain how to solve ____?"	