SAMPLE WRITING ASSIGNMENTS & VARIATIONS

Class summary

1. In 3-4 sentences, summarize what we did in class today.

2. If you were summarizing today’s math lesson for a friend who was absent, what would you tell your friend?

3. Take one minute to write a summary of what we did in class today. Share your summary with a neighbor for two minutes, and then revise your summary to correct mistakes or include any important ideas you missed.

Problem of the week

Sample problem: Choose 10 students from your class. Tally the number of vowels in each person’s name. Use this to predict the results for the rest of the class.

1. Solve the problem, explaining your solution clearly and precisely.

2. Solve the problem in pairs, writing out one explanation of your solution clearly and precisely. Trade solutions with another pair and see if you can understand how they solved the problem. Write a response to their solution, asking questions about anything you don’t understand, comparing and contrasting it to your solution, and giving positive feedback for ideas or explanations you thought were particularly good.

3. Solve the problem and write it up to include the following four sections

   (a) Restate the problem in your own words
   (b) Explain your plan for solving the problem, considering similar problems you have solved in the past, strategies you might you and estimating an answer.
   (c) Work out the problem, carefully showing all your steps
   (d) Reflect on the problem, considering whether the answer makes sense and how it relates to your original estimate, whether there might be other correct answers, and summarizing anything you learned from solving this problem you might be able to use to solve other problems.

Translating between words and symbols

1. Consider the following sequence of instructions.

   (a) Pick a number between 0 and 9.
   (b) Add 15.
   (c) Multiply by 14.
   (d) Subtract 10.

I claim that if you tell me what you end up with, I can tell what the number you picked was. First, try some examples and see if you can figure out my method. Then write what you think the method is and give an example. Can you explain why this method will always work?
2. **For the same sequence of instructions above:** Thinking of the number you pick in step 1 as n, write out expressions that show the number you will get after each step. For each step, explain why the expression matches what happened in the step. Now simplifying the expression for step 4. Explain based on this how you could figure out the number a classmate started with if they just give you the final answer.

3. **Carry out an activity similar to B in class first.** Create a number 'magic trick’ like the one we did in class. Write the instructions you would give to someone and then write out algebraic expressions to show what the result would be.

**Linear Equations**

1. What does it mean for an equation to be a linear equation? Explain in your own words. You might consider the graph of a linear equation, the equation itself, how the two are related and what we mean when we say that something "grows linearly."

2. We have spent a lot of time working with linear equations and have just started to learn about non-linear equations. How can you tell the difference between the two? Think of as many ways as you can to tell them apart.

3. We have spent a lot of time working with linear equations and have just started to learn about non-linear equations. How can you tell the difference between the two? Think of as many ways as you can to tell them apart. Use this comparison to try to explain what it means for an equation to be a linear equation.

**Zeros**

1. Suppose you have two numbers a and b and know that \(ab = 0\). What do you know about the numbers a and b? Why do you know this is true?

2. Suppose you have two numbers a and b and know that \(ab = 0\). What do you know about the numbers a and b? Why do you know this is true? Is the same result true if you started knowing only that \(a + b = 0\) (and not that \(ab = 0\))? 

3. Suppose we know that a fraction \(\frac{a}{b} = 0\).
   
   (a) What can you say about a and b?
   
   (b) Use this information to decide which values of x are solutions to the following equations:
   
   \[
a. \quad \frac{x^2 - 3x - 4}{x^2 - 4} = 0 \quad \quad \quad \quad \quad \quad \quad b. \quad \frac{x^2 - 3x - 4}{x^2 - 1} = 0
   \]

   (c) Compare your answers to the graph of each of the two functions. What do you notice? Can you make any conclusions?

   (d) Explain how to find solutions to an equation where a rational function equals zero.

**Triangles**

1. Explain what it means for two triangles to be congruent.

2. Explain why it makes sense that two triangles with two sides and the angle between them congruent. You should draw pictures as part of your explanation.
3. We have explored the ASA, SAS and SSS shortcuts for showing triangles are congruent. Consider the following shortcuts and either explain why they show the triangles are congruent or give a counterexample (two triangles that share the specified properties but are NOT congruent).

(a) AAA
(b) AAS
(c) SSA

4. Explore SSA as a possible triangle congruence shortcut. For each of the following cases, try to explain why SSA shows the triangles are congruent or give a counterexample. (Draw pictures!)

(a) The two sides have the same length
(b) The angle is opposite the shorter side.
(c) The angle is opposite the longer side.

(Why does this cover all cases?)

5. Explain how you will remember which shortcut work to show triangles are congruent and which do not.

Composition:

1. Explain in words what \( f \circ g \) means.
2. Make up examples for \( f \) and \( g \) and find \( f \circ g \) and \( g \circ f \).
3. In general are \( f \circ g \) and \( g \circ f \) the same? (Either make up examples that show they are different or explain why they are the same.)
4. Consider the functions \( f(x) = 3x + 5 \) and \( g(x) = (x + 3)^2 \).

(a) For each function, write a sentence explaining the actions the function performs on the independent variable.
(b) Write the algebraic equation for the composition of \( f \) and \( g \): \( f \circ g = f(g(x)) \).
(c) Write a sentence explaining the actions \( f \circ g \) performs on the independent variable.
(d) Compare your answers in (a) and (c). Based on this, how would you explain what it means to compose functions?

Transformations

1. Write the formula for the function \( f(x) = x^3 \) shifted 2 to the right and up 3. Why does it make sense that these changes to the formula have the desired effect?
2. Consider the function \( f(x) = -x e^x - 4 \). How is the graph of \( g(x) = x e^x \) related to the graph of \( f(x) \)? Explain your answer.
3. Let \( f(x) \) be a function and \( g(x) = f(x + 3) \). How is the graph of \( f(x) \) related to the graph of \( g(x) \)? Why is this true? This may be an opportunity to introduce students to the idea of trying examples and generalizing what they notice.
How many sides does a circle have?

- Part I: Write a few paragraphs giving as many different answers as you can to the question "How many sides does a circle have?" Make an argument for why each answer is reasonable. In class, we will read each others’ drafts and then debate different possible answers. You will be assigned an answer to defend, so think about all the possible answers!

- Part II: In class, read papers. Assign teams and debate answers. Emphasize how each argument is based on assumptions and implies a definition of 'sides'. Make connections to ways this word has been used in the past, and how the different answers might be generalizations of this. Give Part III as an assignment.

- Part III: Pick the ONE answer to "How many sides does a circle have?" that you think is most reasonable and make an argument for this answer. This should include an explanation for why your choice is reasonable and why other choices are not as reasonable. (Remember the questions and points others raised in class!) You can probably reuse much of what you wrote earlier about the different answers to this question. Pay special attention to concision: do not include unnecessary information. MAXIMUM LENGTH: 2 pages double spaced including pictures. Note: There is NO "right" answer to this question. Your paper will be assessed based on how clearly and concisely you support your point.