

*Assessing the Quality
of Math Writing: The Four Cs*

So you've got to write mathematically? As such, a very reasonable question is *what makes a math paper good?*

It might help you as you're writing to keep an eye on four factors:

Correctness, Completeness, Clarity, and Composition.

When assessing the quality of the writing you produce for this class, I will focus on each of these factors equally, and grades for your work will be assigned accordingly, with equal weight placed on each.

Thus, it's worth our time in examining each factor more carefully, indicating what A-level mathematical writing might look like, or B-level writing, and so on. Before doing so, however, I should note that all four of these factors are important considerations in writing of *any* kind, so they're good things to keep in mind as you begin writing projects in courses other than ours.

Correctness. This is the factor you're likely most familiar with in math classes: many students ask, "does it matter how I did it, if I ended up with the right answer?" Finding the right answer is crucial, and it's important to be sure you never write anything wrong. Thus everything you write should be correct: are your equations right? Do your formulas say what you claim that they say? Have you made sure your proofs are free of mathematical and logical errors?

- **A-level writing** will be totally free of factual and logical errors, aside from a minor arithmetical or algebraic mistake every now and then.
- **B-level writing** will be mostly free of factual and logical errors, though minor computational errors may occur more regularly than in A-level work, and there may be one or two minor logical mistakes arising through sloppiness.
- **C-level writing** will have frequent minor errors of all kinds and allow for a rare moderately large mistake in logic, born of misunderstanding rather than carelessness.
- **D/F-level writing** will contain more incorrect statements than correct ones, errors will be rampant.

Completeness. Even if everything you've said is right, you may not have said it all, and often the omission of crucial information dramatically effects the strength of your writing. (For a simplistic example, imagine if you were to write a paper describing everything there is to know about exponential functions without once mentioning logarithms.) Moreover, it's important that if your paper includes computations or proofs, you be sure to *complete* said computations and proofs: don't leave out critical computations, don't omit logical steps in your proof.

Please beware: an incomplete work of mathematical writing may sound "intelligent," because in leaving out a good deal of information the author might appear to have deeper understanding than she really has. ("She's so smart she doesn't *need* to show her work.")

- **A-level writing** will make mention of all major issues touching upon the topic in question. If computations and proofs are called for, they will be included completely, aside from occasional minor oversights.
- **B-level writing** will hit all the high points, but might omit mention of one or two minor issues. There may be a couple incomplete proofs and computations.
- **C-level writing** will allow omission of a major issue, or a few minor ones. Computations, even if technically correct, are spotty and full of gaps.

- **D/F-level writing** will omit more than it mentions. Proofs and computations will contain almost no information, regardless of their correctness.

Clarity. What are you trying to say? It's possible to write a paper that says a great deal, and says it correctly, but is virtually unreadable because its wording is unclear. This could stem from a number of reasons. Overuse of the passive voice is frequently to blame (saying "the function is differentiated" is less clear than saying "we differentiate the function"). Another mistake is attempting to sound "smart" by misusing words whose meanings one doesn't really understand. If you're not sure of what a word means, don't use it. If there's a choice between a fancy word and a simple one, choose the simple one every time. A general rule of thumb is to think of your audience: if you're writing to a group of peers, be sure to write in a way your peers will be able to fathom. (Indeed, in our class, it's to your peers you should be writing.)

- **A-level writing** will minimize use of the passive voice. Sentences will be simple and easy to understand, free of overly technical jargon or awkward phrasing. Meanwhile, notation and terminology are used clearly and appropriately.
- **B-level writing** will generally be clear, though occasional sentences will be awkward, especially when the author uses terms he doesn't fully understand.
- **C-level writing** will still be understandable, but will often feature unclear explanations and "hifalutin" phrasings designed to be read by an audience at a higher level than the target audience.
- **D/F-level writing** will be impenetrable.

Composition. A well-composed piece of writing will have a coherent overall structure; it will be built up from separate paragraphs or sections, or in some cases problems to be addressed. Each component will in turn be built up from carefully chosen sentences. Generally the piece of writing will have a recognizable introduction setting up the author's thesis or purpose; intermediate sections (or components such as individual paragraphs or problems) supporting this thesis or purpose, including necessary proofs and computations; and a concluding section summarizing the significance of the overall work's ideas, perhaps indicating applications of these ideas elsewhere. Each component will have a clear purpose of its own, headed by one or two topic sentences, and comprising only sentences that work together in support of that component's purpose. Transitions from one component to another will be accomplished smoothly.

- **A-level writing** will contain all of the elements described above, and they will work together to create a coherent picture of the problem or problems at hand.
- **B-level writing** will exhibit the elements described above, but their structure won't be as well-defined. It may not be obvious how one paragraph leads into another, so some transitions may be choppy.
- **C-level writing** will exhibit a structure in some state of decay: although all of the necessary components may be present, they exist independently of one another.
- **D/F-level writing** will resemble a collection of facts thrown together with no discernible logical connection to one another: there will be no composition to speak of.

Please ask me if you have any questions about any of the points discussed above; I'll be happy to give you examples illustrating each of the factors influencing the quality of writing.

Furthermore, I'll *always* be happy to read over your work as you're writing it. Frequent, meaningful feedback is essential in crafting superior writing, and I encourage you to let me and your peers have a look at your work long before it's due in order to give yourself the chance to incorporate corrections and suggestions.