

## SUGGESTIONS FOR WRITING MATHEMATICS

- (1) *Have you clearly stated the problem you are asked to solve?*

Have an audience in mind. Write to someone. And don't assume the person you are writing to remembers the problem. (S)he may have gone on vacation, or been fired; or maybe (s)he just has a bad memory. You need not include every detail of the problem, but there should be enough explanation so that a person not familiar with the situation can understand what you are talking (writing) about.

- (2) *Have you included a sentence or two at the beginning explaining the method you are going to use to address the problem?*

No one is happy being thrown into a sea of mathematics with no clue as to what is going on or why. Be nice. Tell the reader what you are doing, what steps you intend to take, and what advantages you see to your particular approach to the problem.

- (3) *Have you defined all the variables you use in the report?*

*Never* be so rude as to permit a symbol to appear that has not been properly introduced. You may have a mental picture of a triangle with vertices labelled  $A$ ,  $B$ , and  $C$ . When you use those letters no one will know what they stand for unless you tell them. (Even if you have included a graph appropriately labelled, still tell the reader *in the text* what the letters denote.) Similarly, you may be consistent in always using the letter  $j$  to denote a natural number. But how would you expect the reader to know?

It is good practice to italicize variables so that they can be easily distinguished from regular text.

- (4) *Have you stated your answer to the problem in a prominent place in your report? And in a single sentence which stands on its own?*

Don't make your reader hunt through 20 pages of complicated mathematics just to find out what the answer is. Make the answer easy to find. State it in a single sentence and try to make this sentence as transparent as possible. In particular, try not to include any variables in the sentence—because doing so will send your reader on an unwanted journey through the report trying to find out what the variables refer to.

- (5) *Are all tables, diagrams, graphs, etc. clearly labelled?*

- (6) *Have you explained how each formula you use is derived? or where it can be found?*

If, for example, you need to use van der Waals' gas equation, you might see no reason to derive it. But then give the reader a reference where it can be found. No one trusts "facts" that materialize out of thin air.

- (7) *Did you (correctly) solve the problem you were asked to solve?*

Make sure you are working on the right problem. An elegant and clever solution to the wrong problem isn't much help. (Of course, neither is an incorrect solution to the right problem.)

- (8) *Is the logic of your report entirely clear and entirely correct?*

It is an unfortunate fact of life that the slightest error in logic can make a "solution" to a problem totally worthless. It is also unfortunate that even a technically correct argument can be so badly expressed that no one will believe it.

- (9) *Is the mathematics in your report correct?*

Here again, it is possible for a single slip to completely invalidate a solution.

- (10) *In your write-up are your mathematical symbols and mathematical terms all correctly used in a standard fashion? And are all abbreviations standard?*

Few things can make mathematics more confusing than misused or eccentrically used symbols. Symbols should *clarify* arguments not create yet another level of difficulty.

Symbols such as "=" and ">" are used *only* in formulas. They are not substitutes for the words "equals" and "less than" in ordinary text. "Let  $\epsilon > 0$ ," is acceptable; "The radius of the circle is  $< 4$ ," is not.

Logical symbols such as  $\Rightarrow$  and  $\forall$  are rarely appropriate in a write-up: use "If A then B," not " $A \Rightarrow B$ ," and use "for all  $a \in A$ ," or "for all  $a$  in  $A$ ," not " $\forall a \in A$ ." Restrict the use of logical symbols to an occasional display.

- (11) *Are the spelling, punctuation, diction, and grammar of your report all correct?*

- (12) *Have you given credit where credit is due?*

If you use formulas or ideas from either a book or a paper, provide a citation. If you get help from your mother, or a member of your group, or a department tutor, or your instructor, acknowledge it.

- (13) *Is every word, every symbol, and every equation part of a sentence? And is every sentence part of a paragraph?*

For some reason this seems hard for many students. Scratchwork, of course, tends to be full of free floating symbols and formulas. When you write up your work get rid of all this clutter. Keep only what is necessary for a logically complete report. And make sure any formula you keep becomes (an intelligible) part of a sentence. Study how the author of your text deals with the problem of incorporating symbols and formulas into text.

- (14) *Does every sentence start correctly and end correctly?*

Sentences start with capital letters. *Never* start a sentence with a number or with a mathematical or logical symbol. Every declarative sentence ends with a period. Other sentences may end with a question mark or (rarely) an exclamation mark.

(15) *Is the function of every sentence of your report clear?*

Every sentence has a function. It may be a definition. Or it may be an assertion you are about to prove. Or it may be a consequence of the preceding statement. Or it may be a standard result your argument depends on. Or it may be a summary of what you have just proved. **Whatever function a sentence serves, that function should be entirely clear to your reader.**

(16) *Have you avoided all unnecessary clutter?*

Mindless clutter is one of the worst enemies of clear exposition. No one wants to see all the details of your arithmetic or algebra or trigonometry or calculus. Either your reader knows this stuff and could do it more easily than read it, or doesn't know it and will find it meaningless. In either case, get rid of it. If you solve an equation, for example, state what the solutions are; don't show how you used the quadratic formula to find them. Write only things that inform. Logical argument informs, reams of routine calculations do not. Be ruthless in rooting out useless clutter.