

A GUIDE TO WRITING IN MATHEMATICS

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1. Introduction

The purpose of writing in a mathematics course is to communicate your mathematical reasoning in a clear and concise way. Remember, writing helps you to understand mathematic concepts better; by being able to explain a difficult concept to others, you are clarifying the ideas in your own mind.

Here is a brief checklist of the most essential points to keep in mind when writing in math.

2. Checklist

a. Clearly restate the problem to be solved

Briefly introduce your reader to the problem.

Problem: Suppose a die is biased, so that 3 appears twice as often as each other number, but the other appear equally likely. What is the probability that an odd number appears when you roll this die?

Restated: We want to find the probability of the event $E = \{1, 3, 5\}$.

b. Briefly explain how you will approach the problem.

Before plunging into the mathematics involved, you should outline the method that you are going to use. If appropriate, you might want to justify the approach you take. For the problem on the biased die presented in the previous section, you could write:

To calculate $P(E)$, we first need to determine the probabilities for each of the numbers to appear.

c. Define all variables to be used

If the problem that you are working on is relatively complex and involves reference to some quantities several times, it is important that you define all the variables used at the beginning.

When defining variables, make sure that you are sufficiently specific.

Bad	We get the equation $d = rt$, where d is the distance, r is the rate, and t is the time.
Good	We get the equation $d = rt$, where d is the distance from Sam's car to her home (in miles), r is the speed at which she is traveling (measured in miles per hours), and t is the number of hours she has been on the road.

If you make use of diagrams, tables, graphs or other visuals, make sure that they are clearly labelled. For instance, provide a title, label the axes, and parts of a diagram where appropriate.

Do follow mathematical conventions when using variables—*italicize* them!

d. Explain how each formula is derived, or where it can be found.

When formulas are used, you should either derive them or explain where you found them.

When using long and important formulas, you should **centre** them on a new line. For instance,

Bad	Since $0 \leq x^2 + 2x + 1 \leq x^2 + 2x^2 + x^2 = 4x^2$ whenever $x > 1$, it follows that $f(x)$ is $O(x^2)$.
Good	Since $0 \leq x^2 + 2x + 1 \leq x^2 + 2x^2 + x^2 = 4x^2$ whenever $x > 1$, it follows that $f(x)$ is $O(x^2)$.

e. Be mindful of punctuation, spelling and grammar

Like sentences in an essay, writing in math also requires attention to punctuation, spelling and grammar. Note the use of commas, periods, as well as correct grammar used in the example below:

When all of the elements in the universe of discourse can be listed—say, x_1, x_2, \dots, x_n --the existential quantification $\exists xP(x)$ is the same as the disjunction

$$P(x_1) \vee P(x_2) \vee \dots \vee P(x_n),$$

since this disjunction is true if and only if at least one of $P(x_1), P(x_2), \dots, P(x_n)$ is true.

Source: K. Rosen, "Discrete Mathematics and Its Application", 4th edition, page 25.

Reserve the use of mathematical symbols for mathematical statements; do not use them as shorthand in your sentences supporting your explanation.

Bad	We let V = the volume of water of the tank, C = the concentration of salt in the water and m = mass of salt in the water. Then, the formula for the concentration of salt is $C = m/V$.
Bad	We let V stand for the volume of water of the tank, C the concentration of salt in the water and m the mass of salt in the water. Then, the formula for the concentration of salt is C is m/V .
Good	Let V stand for the volume of water of the tank, C the concentration of salt in the water and m the mass of salt in the water. Then, the formula for the concentration of salt is $C = m/V$.

f. Acknowledge your sources; don't be guilty of plagiarism!

As with other disciplines, you should also cite your sources. You may refer to the Writing Centre handout "How Not to Plagiarize/ Standard Documentation Formats".

g. Use phrases such as those listed below to connect ideas, formulas, explanations that you are trying to communicate in your solution.

- *Therefore, so, hence, thus, it follows that, we see that, then, from this we get*
- *We (Let's) assume that, let M represent (stand, be), Given, let*
- *How, demonstrate, prove, show, explain why, find, determine*
- *If, whenever, provided that, when*
- *Since, because*

3. Other Sources of Help: UTSC Math and Statistics Help Centre; UTSC Writing Centre