Technical Writing For Mathematics and Computer Science

With gratitude to Kevin Lee's *A Guide to Writing Mathematics* for many of the examples and suggestions.

David Bressoud
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This talk is available at
www.macalester.edu/~bressoud/talks

Use punctuation correctly.
The following is a complete sentence:

$$1 + 1 = 2.$$

This is not a sentence:

$$x^2 + 3xy - 2y^2$$

If d is Bob's distance above the ground in feet, then $d = 100 - 16t^2$, where t is the number of seconds after Bob's Flugelputz-Levitator is activated. Solving for t in the equation $100 - 16t^2 = 0$, we find that $t = 2.5$. Bob hits the ground after 2.5 seconds.

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$$3^{2x} - 2\left(3^{x}\right) = -1,$$

$$\left(3^{x}\right)^{2} - 2\left(3^{x}\right) + 1 = 0,$$

$$\left(3^{x} - 1\right)^{2} = 0,$$

$$3^{x} = 1,$$

$$x = 0.$$

We want to solve for x in the equation

$$3^{2x} - 2(3^{x}) = -1.$$

We can rewrite this equation in terms of 3^{x} :

$$(3^{x})^{2} - 2(3^{x}) + 1 = 0.$$

After factoring, this becomes

$$(3^{x} - 1)^{2} = 0,$$

and it follows that $3^{x} = 1$, or $x = 0$.

Don’t start a sentence with a formula:

$t = 5$ when $w = 2000$, so we can conclude that the new factory will be completely overrun with cockroaches in 5 years.

f is globberfluxible at $x = 3$.

Better:

Since $t = 5$ when $w = 2000$, we can conclude that the new factory will be completely overrun with cockroaches in 5 years.

The function f is globberfluxible at $x = 3$.

Define notation and technical terms and ***watch how you use them.***

Let P be the escaped wombat population (in thousands) t years after 1990 and suppose that

$$P = 0.5(1.12)^t.$$

The wombat population in 1992 is approximately 672. We can see this by setting $t = 2$ and observing that

$$P = 0.5(1.12)^2 = 0.6272 \text{ thousand wombats.}$$

If we want to predict when the wombat population will reach 2000, we set $P = 2$ and solve for t using logarithms.

$$\begin{aligned} 2 &= 0.5(1.12)^t \\ \log 2 &= \log 0.5 + t \log 1.12 \\ t &= \frac{\log 2 - \log 0.5}{\log 1.12} \approx 12.23 \text{ years.} \end{aligned}$$

The wombat population will reach 2000 in the year 2002.

Lavish attention on your introduction.

A good introduction should “hook” the reader and give some idea of what to expect.

The crisis struck four days before Christmas 1807. The edifice of calculus was shaken to its foundations. In retrospect, the difficulties had been building for decades. Yet while most scientists realized that something had happened, it would take fifty years before the full impact of the event was understood. The nineteenth century would see ever expanding investigations into the assumptions of calculus, an inspection and refitting of the structure from the footings to the pinnacle, so thorough a reconstruction that calculus was given a new name: ***Analysis***.

Use pictures and graphs, but make sure they are properly labeled and help the reader know what to look for.

Looking at the graph, we can see that the result is true.

The graph increases sharply at $t = 3$, confirming our earlier prediction that the robots will begin a homicidal rampage three years from now.

From Steven Krantz, *A Primer of Mathematical Writing*:

"…all the best writers whom I know read their work aloud to themselves. Reading your words aloud forces you to make sense of what you have written, and to deliver it as a coherent whole. If you have never tried this technique, then your first experience with it will be a revelation."

"Envision your reader sitting on a park bench reading your expository [paper], or putting his feet up and drinking a cup of coffee while reading. Do not imagine your reader with a pencil gripped in his fist, slaving away over each detail of your paper."

From Leonard Gillman, *Writing Mathematics Well*:

"Keep the reader informed of what you are doing and of how things stand. I have always enjoyed reading Sierpinski: first he tells you what he is going to do, then he does it, then he tells you he did it…. If you use a key term or symbol after a long spell without it, recall its definition or refer to where it was introduced. Your readers will be grateful."

"Write simple unaffected prose. Writing is harder than speaking because your tone of voice isn't available to help make your point clear. Keep sentences crisp – think of what you want to say and say it. Mathematics is hard enough to read without convoluted writing that makes it harder."

From Nicholas Higham, *Handbook of Writing for the Mathematical Sciences*:

"All writing benefits from revision. Your first attempt can always be made clearer, more concise, more forceful. Effective revision is a skill that is acquired through practice…Put a draft aside for a few days, so that you can examine it with a fresh mind. Then analyze the draft in different ways. Read it aloud and listen to the rhythm. Read it at high speed. Does the text flow? Are the sentences of varying length? Read at the page level, focusing on the shape and the density of ink on the page…Is there a good balance between equations and text? Does the paper look inviting? Do the key ideas stand out ?"

From Joseph M. Williams, *Style: Ten Lessons in Clarity and Grace*:

"Experienced writers know that they have to get something down on paper (or up on the screen) as fast as they can, just to have a draft that they can revise into a better one… When you revise your early confusion into something clearer you better understand your own ideas. And when you understand your ideas better, you express them more clearly, and when you express them more clearly, you understand them even better…and so it goes."

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