

# Mathematical Writing & Typography

A Sample and a Guide for Microsoft Word by Mike Pierce

Please assure yourself now, mathematical writing is hardly different than writing in any other context. The point is still to organize your thoughts into words and sentences and to convey your ideas to a reader. What's likely new to you though are the *mechanics* of writing mathematics: How do you think of mathematical expressions grammatically and fit them into sentences? How do you type math symbols? The purpose of this document is (1) to provide you a sample of mathematical writing to serve as a model for your own writing, and (2) to be a guide on the mechanics of *how* to incorporate mathematics into your writing and to typeset pleasant-looking documents using Microsoft Word.

## Basic Grammar and Typography of Mathematics

Have you ever considered that the equation “ $y = mx + b$ ” is a *sentence*? You can read it out loud as “ $y$  equals  $m$  times  $x$ , plus  $b$ ”. This is a full sentence. The verb is “equals”, and the subject is probably “ $y$ ”, or it might be something on the right-hand side of the equality sign depending on the context. Not every bit of mathematics is a sentence though. A mathematical *expression*, like  $ax^2 + bx + c$ , has no verb. Recognizing whether a bit of mathematics is a full sentence or just an expression helps you incorporate it correctly in your writing. If you're ever unsure how some mathematics should fit into a sentence, read it out loud. It's easier to spot grammar issues, even mathematical ones, by listening to your speech.

Mathematical variables should be italicized in a typeset document (American Mathematical Society, 2022). That is, instead of  $y = mx + b$  it should be  $y = mx + b$ . You can achieve this effect with Microsoft Word's equation editor, which can be found under [INSERT → EQUATION](#). Clicking INSERT → EQUATION every time you want to type math would be a pain though, so instead, when using the desktop version of Microsoft Word the key-combo `alt` + `=` on Windows or `control` + `=` on Mac will start the equation editor quickly.

So far, all the mathematics in this document has fit comfortably inline, but sometimes you'll need to type equations or expressions that are too tall to fit within body text, like

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Complicated equations like these should be given their own space and centered, and treated more like a figure (i.e. an image) in the document than like text.

## Including References & Citations

In your writing you'll often have to draw on the insights of other authors, or on the data or conclusions of researchers. It's important that you provide your reader with directions to find the source of an idea or some data that you reference<sup>1</sup>. There are dozens of style guides describing *how* this referencing should be done in a document (APA, MLA, Chicago, etc.) but they all follow the same pattern: create a list of *references* at the end of your document, and include parenthetical *citations* in your document body after each fact that refers to that reference. For example, the previous section of this document cited the American Mathematical Society's style guide, and directions on how to find that style guide are at the end of this document. Use whichever citation style is favored by your field of study.

Manually managing references can be a pain, so don't do it manually! You can automate this process in the desktop version of Microsoft Word. Whenever you need to insert a new citation, click [REFERENCES → CITATIONS & BIBLIOGRAPHY → INSERT CITATION](#). From here you'll be prompted to enter the information for a new source or insert a citation to a previously used reference. Then as your last step before finishing a document remember to insert a Reference section at the end by clicking [REFERENCES → CITATIONS & BIBLIOGRAPHY → BIBLIOGRAPHY](#). You can always style the references after you insert the References section.

## Typographic Styling in Microsoft Word

It's tedious to style the text in your document manually, making the section headings bigger, changing the font of the title, etc. Don't do this! Word affords you a workflow that is much more efficient. The idea is that you inform Word what each block of text *is* — a title, a section heading, a block quote, etc. — and then choose the appearance of that text uniformly within the document. You do this by highlighting text and assigning it a *Style*, which you can find under [HOME → STYLES](#). After declaring what certain text *is* you can customize the appearance of the document as a whole under the [DESIGN](#) tab.

Many of the design aspects of this document are Microsoft Word's defaults. Here are a few additional typographic recommendations you should consider though:

- The default spacing between lines of body text and paragraphs in Microsoft Word is slightly too narrow. The *Open* paragraph spacing option under the [DESIGN](#) tab is

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<sup>1</sup> Get in the habit of saving links to essays, articles, or other resources that you have find useful, just in case you need to include them as a reference in your writing. My usual workflow is to paste the URLs and a brief description of a resource at the end of my work-in-progress document in case I need to reference it explicitly, then when I'm wrapping up a paper just delete all the URLs I never referred to. By the way, this piece of text you're reading now is called a *footnote*. Footnotes are helpful for including information that is only tangentially related to the topic of your writing outside of the flow of the body text. You can insert a footnote by going to [REFERENCES → INSERT FOOTNOTE](#).

more comfortable. *Body text should only be double-spaced if you need to leave room for written feedback on the document.*

- Either put space between paragraphs *or* indent paragraphs, but don't do both — the beginning of a new paragraph only needs to be indicated once.
- Body text should be *emphasized* by italicizing it. Never underline text; the underline adds visual clutter. Bold text should be used only in special circumstances and should never together with italic text. It's often a better idea to use SMALL CAPS TEXT instead of bold text<sup>2</sup>.
- End-of-line hyphenation should be enabled to break up long words across lines. This makes the right side of your body text look cleaner. You can do this in Word by setting LAYOUT → PAGE SETUP → HYPHENATION to *Automatic*.

There is so much more to good typography beyond this, but discussing the nuance of design isn't the purpose of this document. For further reading, the web-based book *Practical Typography* by Matthew Butterick is a healthy introduction to the subject (Butterick, 2022).

## Incorporating Data into Your Writing

You'll often want to include a table or figures in your document to support the ideas you're writing about. For example, suppose we conducted a survey of 420 college students and asked them a single question: "How do you prefer to write your linear equations?" You can easily organize data like this in a table in Microsoft Excel and paste that table into a Word document, like so:

Response	Number of Respondents
$y = mx + b$	69
$ax + by = c$	16
$(y - y_0) = m(x - x_0)$	42
"I've never written a linear equation before in my life"	293

*Table 1. Responses to "How do you prefer to write your linear equations?"*

Tables of data should either be centered within their own space (like done here) or should be "wrapped" within the body text. This latter choice is notoriously a pain to accomplish in Word, so let's not bother. Notice that table has been assigned the *caption* Table 1, which can

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<sup>2</sup> It's an exercise left to you to figure out how to typeset some text as SMALL CAPS in Word. A hint: this feature is buried deeper than any of the previous features of Word mentioned in this document.

be done under the [REFERENCES → CAPTIONS](#) menu<sup>3</sup>. Giving a table or figure a caption allows you to refer it precisely in your text, so I can write something like “Noting the data in Table 1, it is clear that most college students who have written a linear equation prefer to write it as  $y = mx + b$ .” And like tables, you can include figures and charts in your document by copying them from Microsoft Excel. Charts should also be centered or wrapped in text and assigned a caption to reference.

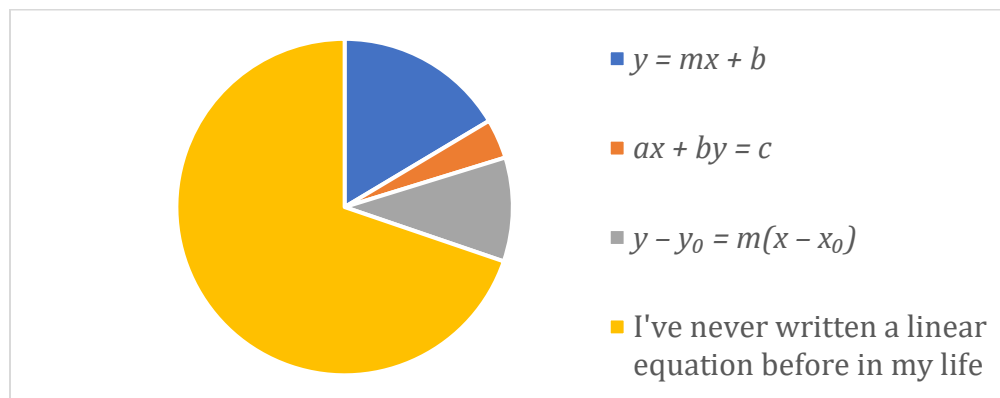


Figure 1. Responses to “How do you prefer to write your linear equations?”

## “Publishing” Your Document

Finally, once you’ve finished writing, revising, and styling your document and are ready to publish it, whether that’s simply by printing it or my sending a digital copy to someone, you should export/save your document as a PDF first. You must think of the .docx Microsoft Word file as your “original manuscript” that you keep to yourself. Publishing a PDF file makes it harder for someone to edit your writing or edit the design of your document, and generally document printers work better with PDF files.

## References

American Mathematical Society. (2022). *ams.org/publications*. Retrieved from [ams.org/publications/authors/AMS-StyleGuide-online.pdf#page=109](https://ams.org/publications/authors/AMS-StyleGuide-online.pdf#page=109)

Butterick, M. (2022, February). *Practical Typography*. Retrieved from [Practical Typography: practicaltypography.com](https://practicaltypography.com)

Pierce, M. (2023, December 1). *Mathematical Writing & Typography*. Retrieved from [coloradomesa.edu/~mapierce2/word/PierceMathWritingSampleGuide.pdf](https://coloradomesa.edu/~mapierce2/word/PierceMathWritingSampleGuide.pdf)

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<sup>3</sup> This menu contains the option to create *cross-references* too. In this guide the text “Table 1” is a cross-reference, which means that this text will change automatically if the caption changes, if say, for example, I decide to insert another table before this one and the numbering must change.