

CSE 312: Mathematical Typesetting in Word and LaTeX

To start an equation in Word, type [Alt]-[=] or click Insert → Equation. To start an equation midline in Latex, wrap in dollar signs, and to start an equation on a new line, wrap in double dollar signs ($[equation]$ for inline, and $[[equation]]$ for a new line).

Many of the symbols/commands are identical (but you may also create shortcuts in Latex). In Word, you will need to press space to see the command converted to the symbol sometimes.

It is recommended to use the equation editor (in word and latex) to do any numerics (even for numbers and single letters for events). (e.g, 9 vs. 9, let E be an event vs. let E be an event).

Symbol	Description	Word Command (<u>must be inside equation!!!</u>)	Latex Command (<u>must be in math mode!!!</u>)	Recommended Latex Shortcut
\mathbb{P} Pr P	Probability	<code>\doubleP</code> Pr P	<code>\mathbb{P}</code> <code>\Pr</code> P	<code>\P</code> (for whichever you prefer)
\mathcal{P}	Power Set	<code>\scriptP</code>	<code>\mathcal{P}</code>	
\mathbb{N} \mathbb{R}	Natural #s Real #s	<code>\doubleN</code> <code>\doubleR</code>	<code>\mathbb{N}</code> <code>\mathbb{R}</code>	<code>\N</code> <code>\R</code>
$\binom{n}{k}$	Combinations (Choose)	<code>(n\atop k)[+space]</code>	<code>{n\choose k}</code> or <code>\binom{n}{k}</code>	
a^k	Superscript	<code>a^k</code>	<code>a^k</code>	
a_k	Subscript	<code>a_k</code>	<code>a_k</code>	
$a \cdot b$ $a \times b$	Multiplication	<code>a\cdot b</code> <code>a\times b</code>	<code>a\cdot b</code> <code>a\times b</code>	
\mathbb{E}	Expectation	<code>\doubleE</code>	<code>\mathbb{E}</code>	<code>\E</code>
Var	Variance	<code>Var</code>	<code>Var</code>	<code>\V</code>
$\frac{a}{b}$	Fraction	<code>a/b [+space]</code>	<code>\frac{a}{b}</code> or <code>\dfrac{a}{b}</code> (bigger)	<code>\f{a}{b}</code>
μ σ θ	Greek Letters (mu, sigma, theta)	<code>\mu</code> <code>\sigma</code> <code>\theta</code> (capitalize for capital greek letters. e.g., <code>\Alpha</code>)	<code>\mu</code> <code>\sigma</code> <code>\theta</code> (capitalize for capital greek letters. e.g., <code>\Alpha</code>)	
$\int_a^b f(x)dx$	Integral	<code>\int_a^b[+space]f(x)dx</code>	<code>\int_{a}^{b}{f(x)dx}</code>	
$\frac{\partial}{\partial \theta}$	Partial derivative	<code>\partial/\partial\theta[+2 spaces]</code>	<code>\frac{\partial}{\partial\theta}</code>	
$\sum_{i=1}^n a_i$	Sum	<code>\sum_{(i=1)^n[+space]a_i</code>	<code>\sum_{i=1}^n {a_i}</code>	
$\prod_{i=1}^n a_i$	Product	<code>\prod_{(i=1)^n[+space]a_i</code>	<code>\prod_{i=1}^n {a_i}</code>	

$\log b$ $\ln b$	Logarithm	$\log[+space] b$ $\ln[+space] b$	$\log\{b\}$ $\ln\{b\}$	
\bar{x}	Average	$x\bar{+space}$	\bar{x}	
\hat{x}	Estimate	$x\hat{+space}$	\hat{x}	
\sqrt{x}	Square Root	$\sqrt{x}[+space]$	\sqrt{x}	
$\bigcup_{i=1}^n E_i$	Union of many	$\bigcup_{(i=1)^n[+space]} E_i$	$\bigcup_{i=1}^n \{E_i\}$	
$\bigcap_{i=1}^n E_i$	Intersection of many	$\bigcap_{(i=1)^n[+space]} E_i$	$\bigcap_{i=1}^n \{E_i\}$	
\cap	Intersection	\cap	\cap	
\cup	Union	\cup	\cup	
\rightarrow	Arrow	\rightarrow or \to	\to	
\Rightarrow	Implication	\rightarrow	\rightarrow or \implies	
\Leftarrow	Converse	\leftarrow	\leftarrow or \impliedby	
\Leftrightarrow	If and only if	\Leftrightarrow	\iff or \Leftrightarrow	
\sim	Distributed as	\sim	\sim	
$<, >, =$ \geq \leq \neq \approx	Comparator	$<, >, =$ \geq \leq \neq \approx	$>, <, =$ \geq \leq \neq \approx	
$\lim_{n \rightarrow \infty} a_n$	Limits	$\lim[+space]_{(n \to \infty)[+space]} a_n$	$\lim_{n \to \infty} \{a_n\}$	
$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$	Vector/Matrix	Insert- \rightarrow equation- \rightarrow Matrix	$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ Note: go to the next column with &. Go to a new line with \\.	
$f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$	Piecewise Function	Insert- \rightarrow equation- \rightarrow bracket (scroll all the way down)	$f(x) = \begin{cases} -x & x < 0 \\ x & x \geq 0 \end{cases}$ Again, go to the next "column" with &. Go to a new line with \\.	
∞	Infinity	∞	∞	
\in, \notin \subset, \subseteq \supset, \supseteq \emptyset \setminus	Inclusion Subset Superset Empty set Set difference	\in, \notin \subset, \subseteq \supset, \supseteq \emptyset \setminus	\in, \notin \subset, \subseteq \supset, \supseteq \emptyset \setminus	

Important: To box your answer in Latex (not Word), use `\boxed{[answer in equation]}`. There isn't a way to do it easily/naturally in Word, but you could create a one-cell table (not required) or simply highlight in yellow (easier).

See Adam Blank's tutorial for a more comprehensive list!

<http://www.countablethoughts.com/documents/HowToLaTeX.pdf>

Most of the commands should be the same for Word and Latex, as you can see above.

Use the following LaTeX shortcuts (you can paste at the top of your Latex source; they're already there in the template). Of course you can create your own too!

```
\newcommand{\N}{\mathbb N}
\newcommand{\E}{\mathbb E}
\newcommand{\V}{\text{Var}}
\newcommand{\P}{\mathbb P}
\newcommand{\f}{\frac}
```

Word vs Latex

Josh's Opinion:

Personally, I use a lot of scratch paper when figuring out how to solve a problem. Since my draft paper is often riddled with eraser marks and failed attempts (haha), I then transcribe it to LaTeX, on the sharelatex.com platform. Word also works, but I'm less efficient with it since I don't know the shortcuts well. We're totally fine with Word, LaTeX, or legible handwriting, but LaTeX is worth learning since it's standard for CS research. If you're typing your homework, **please** reserve enough time (it takes longer than you think)! Also, if using LaTeX, **make sure to compile frequently**, since it's easy to make a typo and end up with annoying compilation errors.

Alex's Opinion:

Word and Latex generally have the same appearance in terms of equations, but Latex probably looks a little better to you. I personally like using Word only because the formatting is easier and most importantly, there is live compilation. If I am typing my homework while doing it (rather than handwriting it then typing it), it is very hard for me to keep my train of thought in Latex since I have to compile it each time I want to see what I just wrote. Believe me, it is almost impossible to read the Latex source directly and be able to process it quickly. Word has the advantage that you immediately see what you type, and so I can do homework directly from Word with no issues and compiling. Latex errors are generally also harder to debug and more annoying, while Word won't give any errors. So it's up to you – use Word if you want to type homework simultaneously while doing the homework, Latex if you want to handwrite first and then typeset, or handwrite and scan your homework if you aren't comfortable with typesetting. If you know how to use one, you basically know the other! I personally reserve using Latex for bigger and more formal projects/papers, as it takes more time with the compilation.

Extra Notes:

1. If you want to have plain text (not italicized) inside equation mode, as below:

$$a^2 = b \text{ [by definition]}$$

Word: $a^2=b$ ["by definition" [+space to remove the quotes and apply formatting]]

Latex: $a^2=b$ [\text{by definition}]

2. In Word, if you start an equation on a new line, it automatically centers. If you want it to left-align, simply type anything outside of equation mode after (easiest way is a space).