

# L<sup>A</sup>T<sub>E</sub>X Math Cheat Sheet

## Packages

**amsmath** Use math macros  
**amssymb** Use more math symbols  
**cancel** Cross out text  
Use before `\begin{document}`. Usage: `\usepackage{package name}`

## Math Mode

### Inline Math

Don't use `$$$` with L<sup>A</sup>T<sub>E</sub>X. Use `\( ... \)` instead.

### Displayed Math

Don't use `$$$` with L<sup>A</sup>T<sub>E</sub>X. Use `\[ ... \]` instead.  
If you use  $\mathcal{A}$ , don't use `\[ ... \]` either, use  
`\begin{equation*} ... \end{equation*}` (unnumbered) and  
`\begin{equation} ... \end{equation}` (numbered).

### Plain Text in Math Mode

Use `\text{...}` or `\textnormal{...}` or `\mathrm{...}` for inline text.  
Note the different outcomes depending on your font choice. `\text{...}` is usually the best choice. Examples: *math* text normaltext mathrm  
Use `\intertext{...}` for a complete line, only in displayed mode.

## Sets of Equations

`&=` Typeset and aligns equations on `=`. Works with any relation.  
Use `\mathrel{...}` or `\stackrel{top}{\underset{bot}{}}` for custom relations  
`&` Add another column `\\` Add another line

### align

Note that align must **not** be set in math mode!  
Usage: `\begin{align} aa &< A & b &\stackrel{!}{=}& B \\ c &\mathrel{=}_{42}& C &d &= D \end{align}` Outcome:

$$\begin{array}{ll} aa < A & b \stackrel{!}{=} B \\ c =_{42} C & d = D \end{array}$$

### aligned

Allows for further mathstuff left/right, must be set in math mode.  
Usage: `\begin{aligned} aa &= A & b &= B ... \end{aligned}`  
Outcome:

$$\begin{array}{ll} aa = A & b = B \\ c = C & d = D \end{array}$$

### gather

Centered equations, one column. Must **not** be set in math mode!  
Usage: `\begin{gather} aa = A \\ b = B \end{gather}`  
Outcome:

$$\begin{array}{l} aa = A \\ b = B \end{array}$$

## Long Terms/Equations

### multline

Set long terms with multiple lines. Must **not** be set in math mode!  
Usage: `\begin{multline} A = 1 + ... + 5 \\ + 6 + 7 + ... + 14 + 15 \end{multline}`  
Outcome:

$$A = 1 + 2 + 3 + 4 + 5$$

$$+ 6 + 7 + 8 + 9 + 10 + 11 + 12 + 13 + 14 + 15 \quad (5)$$

### split

Set long equations with multiple lines. Must be set in math mode.  
Usage:  
`\begin{split} A &= 5+9+3 \\ &= 14+3 \\ A &= 17 \end{split}`  
Outcome:

$$\begin{array}{l} A = 5 + 9 + 3 \\ \quad = 14 + 3 \\ A = 17 \end{array}$$

## Cases

Set if-then-else cases. Must be set in math mode.  
Usage: `\begin{cases} 1 & \text{if } A=... \\ 2 & \text{if } B=... \end{cases}`  
Outcome:

$$\begin{cases} 1 & \text{if } A=... \\ 2 & \text{if } B=... \end{cases}$$

## Matrices

### matrix

Set simple matrices. Must be set in math mode.

`\( \begin{bmatrix} a & b \\ c & d \end{bmatrix} \)`

$$\begin{array}{lll} \text{Bmatrix} & \begin{bmatrix} a & b \\ c & c \end{bmatrix} & \text{vmatrix} \quad \begin{vmatrix} a & b \\ c & c \end{vmatrix} & \text{Vmatrix} & \left\| \begin{array}{l} a & b \\ c & c \end{array} \right\| \\ \text{pmatrix} & \begin{pmatrix} a & b \\ c & c \end{pmatrix} & \text{matrix} & \begin{array}{cc} a & b \\ c & c \end{array} \end{array}$$

A `smallmatrix` for inline use only is available as well.  $\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}$

### array

- (1) **array**  
(2) Set flexible matrices. Allows for further mathstuff left/right, must be set in math mode.

Usage: `\begin{array}{lcl} a & b & c \\ \hline d & e & f \end{array}`  
l for left aligned, c for centered, r for right aligned column. | for optional vertical line. `\hline` adds a horizontal line.  
Outcome:

$$\begin{array}{cc|c} a & b & c \\ d & e & f \end{array}$$

## Fractions

### frac

- (3) **frac**  
(4) Usage: `\( \frac{1}{2} \)`  
Outcome:  $\frac{1}{2}$

### cfrac

Set continued fractions, must be set in math mode.  
Usage: `\cfrac{1}{1 + \cfrac{2}{33}}`  
Outcome:

$$\frac{1}{1 + \frac{2}{33}}$$

## Roots

Usage: `\( \sqrt[3]{8} \)` Outcome:  $\sqrt[3]{8}$   
If the root looks like this  $\sqrt[3]{b}$ , use `\leftroot{n}` and `\uproot{n}` to correct positioning.  
Usage: `\( \sqrt[\uproot{3}]{\leftroot{1}}{a_3}{8} \)`  
Outcome:  $\sqrt[3]{8}$

## Miscellaneous

### Numbering

Use `equation*`, `align*`, `gather*`, `multline*` to suppress numbering.  
Use `\nonumber` to suppress numbering for current line in any math environment.

### Brackets

Use `\leftX` paired with `\rightY` with X and Y being `( ) [ ]`  
`\langle` for  $\langle$  `\rangle` for  $\rangle$  `\lbrace` for  $\{$  `\rbrace` for  $\}$   
`\lfloor` for  $\lfloor$  `\lceil` for  $\lceil$  `\vert` for  $|$  `\Vert` for  $\|$   
or `.` to suppress one bracket. These brackets adapt in height to fit their inner object.

Usage: `\( \left( \frac{1}{2} \right) \)`  
Outcome:  $(\frac{1}{2})$  as opposed to  $(\frac{1}{2})$

## Multi-line limits, Custom Operators & Sidesets

Usage: `\sum_{\substack{1 \leq i \leq p \\ 1 \leq j \leq q}}` Outcome:  $\sum_{1 \leq i \leq p, 1 \leq j \leq q}$   
Usage: `\operatorname{myop}\{x\}` Outcome:  $\operatorname{myop} x$   
Usage: `\sideset_{\{1\}^{\{2\}}}{\{3\}^{\{4\}}}\sum` Outcome:  $\sum_{1^2}^3 4$

### cancel

Usage: `\cancel{22}` Outcome:  $\cancel{22}$

`\cancel{\frac{(x+2)(x-1)}{(x-1)(x+1)}}` `\bcancel{\frac{(x+2)(x-1)}{(x-1)(x+1)}}` `\xcancel{\frac{(x+2)(x-1)}{(x-1)(x+1)}}`

## Sub-/Superscription

Use `_n` to subscript and `^n` to superscript n.  
Usage: `\( a_{1_1}^{2_1} \)` Outcome:  $a_{1_1}^{2_1}$

## Symbols

$\sum_{i=1}^n$	<code>\sum_{i=1}^n</code>	$\prod_{i=1}^n$	<code>\prod_{i=1}^n</code>
$\rightarrow$	<code>\rightarrow</code>	$\leftarrow$	<code>\leftarrow</code>
$\Rightarrow$	<code>\Rightarrow</code>	$\Rrightarrow$	<code>\Rrightarrow</code>
$\uparrow$	<code>\uparrow</code>	$\downarrow$	<code>\downarrow</code>
$\Uparrow$	<code>\Uparrow</code>	$\Downarrow$	<code>\Downarrow</code>
$\xrightarrow[3]{44}$	<code>\xrightarrow[3]{44}</code>	$\xleftarrow[3]{44}$	<code>\xleftarrow[3]{44}</code>
$\pi$	<code>\pi</code>	$\aleph$	<code>\aleph</code>
$\overrightarrow{abc}$	<code>\overrightarrow{abc}</code>	$\overleftarrow{abc}$	<code>\overleftarrow{abc}</code>
$\widehat{abc}$	<code>\widehat{abc}</code>	$\widetilde{abc}$	<code>\widetilde{abc}</code>
$\overbrace{abc}$	<code>\overbrace{abc}</code>	$\underbrace{abc}$	<code>\underbrace{abc}</code>
$*$	<code>\ast</code>	$\cdot$	<code>\cdot</code>
$\times$	<code>\times</code>	$\div$	<code>\div</code>
$\leq \not\leq$	<code>\leq \nleq</code>	$\geq \not\geq$	<code>\geq \ngeq</code>
$\lessgtr$	<code>\lessgtr</code>	$\neq$	<code>\neq</code>
$\pm$	<code>\pm</code>	$\sim$	<code>\sim</code>
$\in$	<code>\in</code>	$\notin$	<code>\notin</code>
$\forall$	<code>\forall</code>	$\exists$	<code>\exists</code>
$\sin(x)$	<code>\sin(x)</code>	$\cos(x)$	<code>\cos(x)</code>
$\log n$	<code>\log n</code>	$\ln n$	<code>\ln n</code>