

# The okicmd and okithm Packages

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## 1 The okicmd Package

### 1.1 Letters

Input	Output	L <sup>A</sup> T <sub>E</sub> X equivalent
1	$\ell$	<code>\ell</code>
<code>\ell</code>	$l$	<code>l</code>
<code>\epsilon</code>	$\varepsilon$	<code>\varepsilon</code>
<code>\varepsilon</code>	$\epsilon$	<code>\epsilon</code>
<code>\phi</code>	$\varphi$	<code>\varphi</code>
<code>\varphi</code>	$\phi$	<code>\phi</code>

### 1.2 Parentheses

Possible size options are `\big`, `\Big`, `\bigg`, and `\Bigg`. If a size option is missing, parentheses' size is adjusted automatically.

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\prn{\cdot}</code>	$(\cdot)$	<code>\mleft(\cdot\mright)</code>
<code>\prn[\big]{\cdot}</code>	$(\cdot)$	<code>\bigl(\cdot\bigr)</code>
<code>\prn[\Big]{\cdot}</code>	$(\cdot)$	<code>\Bigl(\cdot\Bigr)</code>
<code>\prn[\bigg]{\cdot}</code>	$(\cdot)$	<code>\biggl(\cdot\biggr)</code>
<code>\prn[\Bigg]{\cdot}</code>	$(\cdot)$	<code>\Biggl(\cdot\Biggr)</code>
<code>\curl{\cdot}</code>	$\{\cdot\}$	<code>\mleft\{\cdot\mright\}</code>
<code>\sqbr{\cdot}</code>	$[\cdot]$	<code>\mleft[\cdot\mright]</code>
<code>\agbr{\cdot}</code>	$\langle\cdot\rangle$	<code>\mleft\langle\cdot\mright\rangle</code>
<code>\dbbr{\cdot}</code>	$\llbracket\cdot\rrbracket$	<code>\mleft\llbracket\cdot\mright\rrbracket</code>
<code>\pipe{\cdot}</code>	$ \cdot $	<code>\mleft \cdot\mright </code>
<code>\dbpp{\cdot}</code>	$\  \cdot \ $	<code>\mleft\ \cdot\mright\ </code>
<code>\floor{\cdot}</code>	$\lfloor\cdot\rfloor$	<code>\mleft\lfloor\cdot\mright\rfloor</code>
<code>\ceil{\cdot}</code>	$\lceil\cdot\rceil$	<code>\mleft\lceil\cdot\mright\rceil</code>

### 1.3 Logic

Input	Output	L <sup>A</sup> T <sub>E</sub> X equivalent
<code>\bigland</code>	$\bigwedge$	<code>\bigwedge</code>
<code>\biglor</code>	$\bigvee$	<code>\bigvee</code>
<code>a \defeq b</code>	$a := b$	<code>a \coloneqq b</code>
<code>a \eqdef b</code>	$b =: a$	<code>a \eqqcolon b</code>
<code>P \defiff Q</code>	$P \stackrel{\text{def}}{\iff} Q$	<code>P \overset{\mathrm{def}}{\iff} Q</code>

### 1.4 Sets

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\set{a \in S}</code>	$\{a \in S\}$	<code>\left\{a \in S\right\}</code>
<code>\set{a \in S}[a^2 = 1]</code>	$\{a \in S \mid a^2 = 1\}$	<code>\left\{a \in S\mathrel{\{} \middle  \mathrel{\}} a^2 = 1\right\}</code>
<code>\set*{a}[\$a\$ is odd]</code>	$\{a \mid a \text{ is odd}\}$	<code>\left\{a\mathrel{\{} \middle  \mathrel{\}\text{\textit{\$a\$ is odd}}}\right\}</code>
<code>\card{X}</code>	$ X $	<code>\left X\right </code>
<code>X \syndif Y</code>	$X \triangle Y$	<code>X \mathbin{\triangle} Y</code>
<code>\setN</code>	$\mathbb{N}$	<code>\mathbb{N}</code>
<code>\setZ</code>	$\mathbb{Z}$	<code>\mathbb{Z}</code>
<code>\setQ</code>	$\mathbb{Q}$	<code>\mathbb{Q}</code>
<code>\setR</code>	$\mathbb{R}$	<code>\mathbb{R}</code>
<code>\setC</code>	$\mathbb{C}$	<code>\mathbb{C}</code>
<code>\setH</code>	$\mathbb{H}$	<code>\mathbb{H}</code>
<code>\setF</code>	$\mathbb{F}$	<code>\mathbb{F}</code>
<code>\setK</code>	$\mathbb{K}$	<code>\mathbb{K}</code>
<code>\setZp</code>	$\mathbb{Z}_{\geq 0}$	<code>\mathbb{Z}_{\geq 0}</code>
<code>\setQp</code>	$\mathbb{Q}_{\geq 0}$	<code>\mathbb{Q}_{\geq 0}</code>
<code>\setRp</code>	$\mathbb{R}_{\geq 0}$	<code>\mathbb{R}_{\geq 0}</code>
<code>\setNpp</code>	$\mathbb{N}_{> 0}$	<code>\mathbb{N}_{&gt; 0}</code>
<code>\setZpp</code>	$\mathbb{Z}_{> 0}$	<code>\mathbb{Z}_{&gt; 0}</code>
<code>\setQpp</code>	$\mathbb{Q}_{> 0}$	<code>\mathbb{Q}_{&gt; 0}</code>
<code>\setRpp</code>	$\mathbb{R}_{> 0}$	<code>\mathbb{R}_{&gt; 0}</code>

### 1.5 Maps

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\doms{X}{Y}</code>	$X \rightarrow Y$	<code>\{X\}\to\{Y\}</code>
<code>\funcdoms{f}{X}{Y}</code>	$f : X \rightarrow Y$	<code>\{f\}\vcentcolon\{X\}\to\{Y\}</code>
<code>\restr{f}{S}</code>	$f _S$	<code>\left.f\right _{\{S\}}</code>
<code>\id_K</code>	$\text{id}_K$	<code>\operatorname{id}_K</code>
<code>\dom f</code>	$\text{dom } f$	<code>\operatorname{dom} f</code>
<code>\cod f</code>	$\text{cod } f$	<code>\operatorname{cod} f</code>
<code>\supp f</code>	$\text{supp } f$	<code>\operatorname{supp} f</code>

## 1.6 Lattices

Input	Output	L <sup>A</sup> T <sub>E</sub> X equivalent
<code>x \meet y</code>	$x \wedge y$	<code>x \mathbin{\wedge} y</code>
<code>x \join y</code>	$x \vee y$	<code>x \mathbin{\vee} y</code>
<code>\bigmeet</code>	$\bigwedge$	<code>\bigwedge</code>
<code>\bigjoin</code>	$\bigvee$	<code>\bigvee</code>

## 1.7 Algebra

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\Hom(G)</code>	$\text{Hom}(G)$	<code>\operatorname{Hom}(G)</code>
<code>\End R</code>	$\text{End } R$	<code>\operatorname{End} R</code>
<code>\Aut_k K</code>	$\text{Aut}_k K$	<code>\operatorname{Aut}_k K</code>
<code>\gen{a,b}</code>	$\langle a, b \rangle$	<code>\left\langle a, b \right\rangle</code>
<code>\gen{a,b}[ab = e]</code>	$\langle a, b \mid ab = e \rangle$	<code>\left\langle a, b \middle  \mathrel{ab = e} \right\rangle</code>
<code>\abel{G}</code>	$G_{\text{ab}}$	<code>G_{\mathrel{ab}}</code>
<code>\comm{G}</code>	$[G, G]$	<code>\left[ G, G \right]</code>
<code>\ord G</code>	$\text{ord } G$	<code>\operatorname{ord} G</code>
<code>\sym_n</code>	$\mathfrak{S}_n$	<code>\mathfrak{S}_n</code>
<code>\sgn(\sigma)</code>	$\text{sgn}(\sigma)$	<code>\operatorname{sgn}(\sigma)</code>
<code>\mult{R}</code>	$R^\times$	<code>R^{\times}</code>
<code>\M_{m,n}(R)</code>	$M_{m,n}(R)$	<code>\operatorname{M}_{m,n}(R)</code>
<code>\GL_n(R)</code>	$\text{GL}_n(R)$	<code>\operatorname{GL}_n(R)</code>
<code>\SL_n(R)</code>	$\text{SL}_n(R)$	<code>\operatorname{SL}_n(R)</code>
<code>\O(n)</code>	$O(n)$	<code>\operatorname{O}(n)</code>
<code>\SO(n)</code>	$\text{SO}(n)$	<code>\operatorname{SO}(n)</code>
<code>\U(n)</code>	$\text{U}(n)$	<code>\operatorname{U}(n)</code>
<code>\SU(n)</code>	$\text{SU}(n)$	<code>\operatorname{SU}(n)</code>
<code>\GL(q)</code>	$\text{GL}(q)$	<code>\operatorname{GL}(q)</code>
<code>L \extends K</code>	$L / K$	<code>L \mathbin{/} K</code>
<code>\ch(K)</code>	$\text{ch}(K)$	<code>\operatorname{ch}(K)</code>

## 1.8 Number Theory

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\abs{x}</code>	$ x $	<code>\left  x \right </code>
<code>\intset{n}</code>	$[n]$	<code>\left[ n \right]</code>
<code>a \coprime b</code>	$a \perp b$	<code>a \mathrel{\bot} b</code>
<code>a \divides b</code>	$a \mid b$	<code>a \mid b</code>
<code>a \ndivides b</code>	$a \nmid b$	<code>a \nmid b</code>

## 1.9 Linear Algebra

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\tr A</code>	$\operatorname{tr} A$	<code>\operatornamename{tr} A</code>
<code>\rank A</code>	$\operatorname{rank} A$	<code>\operatornamename{rank} A</code>
<code>\trank A</code>	$\operatorname{t-rank} A$	<code>\operatornamename{t-rank} A</code>
<code>\Pf A</code>	$\operatorname{Pf} A$	<code>\operatornamename{Pf} A</code>
<code>\diag(a_1,\dotsc,a_n)</code>	$\operatorname{diag}(a_1,\dots,a_n)$	<code>\operatornamename{diag}</code> <code>(a_1,\dotsc,a_n)</code>
<code>\blockdiag(A_1,\dotsc,A_n)</code>	$\operatorname{block-diag}(A_1,\dots,A_n)$	<code>\operatornamename{block-diag}</code> <code>(A_1,\dotsc,A_n)</code>
<code>\vectorize(A)</code>	$\operatorname{vec}(A)$	<code>\operatornamename{vectorize}(A)</code>
<code>\Row(A)</code>	$\operatorname{Row}(A)$	<code>\operatornamename{Row}(A)</code>
<code>\Col(A)</code>	$\operatorname{Col}(A)$	<code>\operatornamename{Col}(A)</code>
<code>\onevec</code>	$\mathbb{1}$	<code>\mathds{1}</code>
<code>\trsp{A}</code>	$A^\top$	<code>A^\top</code>
<code>\adjo{A}</code>	$A^*$	<code>A^*</code>
<code>\inpr{x}{y}</code>	$\langle x, y \rangle$	<code>\left\langle x \right\rangle, \{y\}</code> <code>\right\rangle</code>

## 1.10 Analysis

Input	Output	L <sup>A</sup> T <sub>E</sub> X (almost) equivalent
<code>\intoo{a,b}</code>	$(a, b)$	<code>\left(a,b\right)</code>
<code>\intoc{a,b}</code>	$(a, b]$	<code>\left(a,b\right]</code>
<code>\intco{a,b}</code>	$[a, b)$	<code>\left[a,b\right)</code>
<code>\intcc{a,b}</code>	$[a, b]$	<code>\left[a,b\right]</code>
<code>\e</code>	$e$	<code>\mathrm{e}</code>
<code>\d</code>	$d$	<code>\mathrm{d}</code>
<code>\dif{f}{x}</code>	$\frac{df}{dx}$	<code>\frac{\mathrm{d} f}{\mathrm{d} x}</code>
<code>\pdif{f}{x}</code>	$\frac{\partial f}{\partial x}$	<code>\frac{\partial f}{\partial x}</code>
<code>\ddif{f}{x}</code>	$\frac{d^2 f}{dx^2}$	<code>\frac{\mathrm{d}^2 f}{\mathrm{d} x^2}</code>
<code>\dpdif{f}{x}</code>	$\frac{\partial^2 f}{\partial x^2}$	<code>\frac{\partial^2 f}{\partial x^2}</code>

## 1.11 Complex Analysis

Input	Output	L <sup>A</sup> T <sub>E</sub> X equivalent
<code>\i</code>	$i$	<code>\mathrm{i}</code>
<code>\Re z</code>	$\operatorname{Re} z$	<code>\operatornamename{Re} z</code>
<code>\Im z</code>	$\operatorname{Im} z$	<code>\operatornamename{Im} z</code>
<code>\Arg z</code>	$\operatorname{Arg} z$	<code>\operatornamename{Arg} z</code>
<code>\Log z</code>	$\operatorname{Log} z$	<code>\operatornamename{Log} z</code>
<code>\Sin z</code>	$\operatorname{Sin} z$	<code>\operatornamename{Sin} z</code>
<code>\Cos z</code>	$\operatorname{Cos} z$	<code>\operatornamename{Cos} z</code>
<code>\Tan z</code>	$\operatorname{Tan} z$	<code>\operatornamename{Tan} z</code>
<code>\Res_{z=0} f(z)</code>	$\operatorname{Res}_{z=0} f(z)$	<code>\operatornamename*{Res}_{z=0} f(z)</code>

## 1.12 Optimization

Input	Output	L <sup>A</sup> T <sub>E</sub> X equivalent
<code>\argmin_{x \in S} f(x)</code>	$\arg \min_{x \in S} f(x)$	<code>\operatorname*{arg~min}_{x \in S} f(x)</code>
<code>\argmax_{x \in S} f(x)</code>	$\arg \max_{x \in S} f(x)$	<code>\operatorname*{arg~max}_{x \in S} f(x)</code>
<code>\Order(n)</code>	$O(n)$	<code>\mathrm{O}(n)</code>
<code>\order(n)</code>	$o(n)$	<code>\mathrm{o}(n)</code>
<code>\poly(n)</code>	$\text{poly}(n)$	<code>\mathrm{poly}(n)</code>
<code>\polylog(n)</code>	$\text{polylog}(n)$	<code>\mathrm{polylog}(n)</code>

## 2 The okithm Package

### 2.1 Theorems

If the language is set to Japanese like by `\usepackage[main = japanese]{babel}`, okithm will translate all the environment titles (Theorem, Definition, etc.) into Japanese. You can disable theorems by giving the option `notheorem` to okicmd.

```

1 \begin{theorem}[Awesome theorem]
2   The square root  $\sqrt{2}$  of two is irrational.
3 \end{theorem}
4
5 \begin{definition}[Coprime]
6   Integers  $a$  and  $b$  are said to be \emph{coprime} if their greatest common
   divisor is one.
7 \end{definition}
8
9 \begin{lemma}
10  If  $a$  and  $b$  are coprime, so are  $a^2$  and  $b^2$ .
11 \end{lemma}
12
13 \begin{proposition}
14  If  $\sqrt{2} = a/b$ , then  $a^2 = 2b^2$ .
15 \end{proposition}
16
17 \begin{corollary}
18  If  $\sqrt{2} = a/b$  with  $a$  and  $b$  being coprime, then  $a$  is even.
19 \end{corollary}
20
21 \begin{example}
22  If  $a = 2$  and  $b = 1$ , then  $a$  is even but  $\sqrt{2} \neq a/b$ .
23 \end{example}
24
25 \begin{remark}
26  Note that  $a$  and  $b$  must be integers.
27 \end{remark}
28
29 \begin{proof}[of Awesome theorem]
30  Suppose to the contrary that  $\sqrt{2} = a/b$  with coprime  $a$  and  $b$ .
31  Then both  $a$  and  $b$  are even, which contradicts the assumption.
32 \end{proof}
```

---

**Theorem 2.1** (Awesome theorem). *The square root  $\sqrt{2}$  of two is irrational.*

**Definition 2.2** (Coprime). Integers  $a$  and  $b$  are said to be *coprime* if their greatest common divisor is one.

**Lemma 2.3.** *If  $a$  and  $b$  are coprime, so are  $a^2$  and  $b^2$ .*

**Proposition 2.4.** *If  $\sqrt{2} = a/b$ , then  $a^2 = 2b^2$ .*

**Corollary 2.5.** *If  $\sqrt{2} = a/b$  with  $a$  and  $b$  being coprime, then  $a$  is even.*

**Example 2.6.** If  $a = 2$  and  $b = 1$ , then  $a$  is even but  $\sqrt{2} \neq a/b$ . □

**Remark 2.7.** Note that  $a$  and  $b$  must be integers.

*Proof* (of Awesome theorem). Suppose to the contrary that  $\sqrt{2} = a/b$  with coprime  $a$  and  $b$ . Then both  $a$  and  $b$  are even, which contradicts the assumption. □

## 2.2 Algorithms

You can disable algorithms by setting the option `noalgorithm`.

```
1 \begin{algorithmic}[1]
2   \Input{$n$ \in \mathbb{N}}
3   \Output{$n(n+1)/2$}
4   \State{$s \leftarrow 0$}
5   \ForTo{$i = 1$}{$n$}
6     \State{$s \leftarrow s + i$}
7   \EndFor
8   \State{\Return $s$}
9 \end{algorithmic}
```

---

**Input** :  $n \in \mathbb{N}$

**Output:**  $n(n+1)/2$

```
1:  $s \leftarrow 0$ 
2: for  $i = 1$  to  $n$  do
3:    $s \leftarrow s + i$ 
4: return  $s$ 
```

## 2.3 Optimization Problems

You can change `minimize`, `maximize` and `subject to` into `min`, `max` and `s.t.`, respectively, by setting the option `optstyle = short`.