

The okicmd and okithm Packages

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1 The okicmd Package

1.1 Alphabets

Input	Output
1	ℓ
<code>\ell</code>	l
<code>\epsilon</code>	ε
<code>\varepsilon</code>	ϵ
<code>\phi</code>	φ
<code>\varphi</code>	ϕ

1.2 Parentheses

Input	Output
<code>\prn{\cdot}</code>	(\cdot)
<code>\prn[\big]{\cdot}</code>	(\cdot)
<code>\prn[\Big]{\cdot}</code>	(\cdot)
<code>\prn[\bigg]{\cdot}</code>	(\cdot)
<code>\prn[\Bigg]{\cdot}</code>	(\cdot)
<code>\curl{\cdot}</code>	$\{\cdot\}$
<code>\sqbr{\cdot}</code>	$[\cdot]$
<code>\agbr{\cdot}</code>	$\langle \cdot \rangle$
<code>\dbbr{\cdot}</code>	$\llbracket \cdot \rrbracket$
<code>\abs{\cdot}</code>	$ \cdot $
<code>\norm{\cdot}</code>	$\ \cdot\ $
<code>\floor{\cdot}</code>	$\lfloor \cdot \rfloor$
<code>\ceil{\cdot}</code>	$\lceil \cdot \rceil$

1.3 Logic

Input	Output
<code>\bigland</code>	\bigwedge
<code>\biglor</code>	\bigvee
<code>a \defeq b</code>	$a := b$
<code>a \eqdef b</code>	$b =: a$
<code>P \defiff Q</code>	$P \stackrel{\text{def}}{\iff} Q$

1.4 Sets

Input	Output
<code>\set{a \in S}</code>	$\{a \in S\}$
<code>\set{a \in S}[a^2 = 1]</code>	$\{a \in S \mid a^2 = 1\}$
<code>\intset{n}</code>	$[n]$
<code>\card{X}</code>	$ X $
<code>X \symdif Y</code>	$X \triangle Y$
<code>\setN</code>	\mathbb{N}
<code>\setZ</code>	\mathbb{Z}
<code>\setQ</code>	\mathbb{Q}
<code>\setR</code>	\mathbb{R}
<code>\setC</code>	\mathbb{C}
<code>\setH</code>	\mathbb{H}
<code>\setF</code>	\mathbb{F}
<code>\setK</code>	\mathbb{K}
<code>\setZp</code>	$\mathbb{Z}_{\geq 0}$
<code>\setQp</code>	$\mathbb{Q}_{\geq 0}$
<code>\setRp</code>	$\mathbb{R}_{\geq 0}$

1.5 Maps

Input	Output
<code>\doms{X}{Y}</code>	$X \rightarrow Y$
<code>\funcdoms{f}{X}{Y}</code>	$f: X \rightarrow Y$
<code>\restr{f}{S}</code>	$f _S$
<code>\id_K</code>	id_K
<code>\dom f</code>	$\text{dom } f$
<code>\cod f</code>	$\text{cod } f$
<code>\supp f</code>	$\text{supp } f$

1.6 Lattices

Input	Output
<code>x \meet y</code>	$x \wedge y$
<code>x \join y</code>	$x \vee y$
<code>\bigmeet</code>	\bigwedge
<code>\bigjoin</code>	\bigvee

1.7 Algebra

Input	Output
<code>\Hom(G)</code>	$\text{Hom}(G)$
<code>\End R</code>	$\text{End } R$
<code>\Aut_k K</code>	$\text{Aut}_k K$
<code>\gen{a, b}</code>	$\langle a, b \rangle$
<code>\gen{a, b}[ab = e]</code>	$\langle a, b \mid ab = e \rangle$
<code>\abel{G}</code>	G_{ab}
<code>\comm{G}</code>	$[G, G]$
<code>\sym_n</code>	\mathfrak{S}_n
<code>\sgn(\sigma)</code>	$\text{sgn}(\sigma)$
<code>\mult{R}</code>	R^\times
<code>\M_{m,n}(R)</code>	$M_{m,n}(R)$
<code>\GL_n(R)</code>	$\text{GL}_n(R)$
<code>\SL_n(R)</code>	$\text{SL}_n(R)$
<code>\O(n)</code>	$O(n)$
<code>\SO(n)</code>	$\text{SO}(n)$
<code>\U(n)</code>	$U(n)$
<code>\SU(n)</code>	$\text{SU}(n)$

1.8 Number Theory

Input	Output
<code>a \coprime b</code>	$a \perp b$
<code>a \divides b</code>	$a \mid b$
<code>a \ndivides b</code>	$a \nmid b$

1.9 Linear Algebra

Input	Output
<code>\tr A</code>	$\text{tr } A$
<code>\rank A</code>	$\text{rank } A$
<code>\trank A</code>	$\text{t-rank } A$
<code>\diag(a_1, \ldots, a_n)</code>	$\text{diag}(a_1, \dots, a_n)$
<code>\blockdiag(A_1, \ldots, A_n)</code>	$\text{block-diag}(A_1, \dots, A_n)$
<code>\vectorize(A)</code>	$\text{vec}(A)$
<code>\Row(A)</code>	$\text{Row}(A)$
<code>\Col(A)</code>	$\text{Col}(A)$
<code>\onevec</code>	$\mathbf{1}$
<code>\trsp{A}</code>	A^\top
<code>\adjo{A}</code>	A^*
<code>\inpr{x}{y}</code>	$\langle x, y \rangle$

1.10 Analysis

Input	Output
<code>\e</code>	e
<code>\d</code>	d
<code>\dif{f}{x}</code>	$\frac{df}{dx}$
<code>\pdif{f}{x}</code>	$\frac{\partial f}{\partial x}$
<code>\ddif{f}{x}</code>	$\frac{d^2 f}{dx^2}$
<code>\dpdif{f}{x}</code>	$\frac{\partial^2 f}{\partial x^2}$

1.11 Complex Analysis

Input	Output
<code>\i</code>	i
<code>\Re z</code>	$\operatorname{Re} z$
<code>\Im z</code>	$\operatorname{Im} z$
<code>\Arg z</code>	$\operatorname{Arg} z$
<code>\Loc z</code>	$\operatorname{Log} z$
<code>\Sin z</code>	$\operatorname{Sin} z$
<code>\Cos z</code>	$\operatorname{Cos} z$
<code>\Tan z</code>	$\operatorname{Tan} z$
<code>\Res_{z=0} f(z)</code>	$\operatorname{Res}_{z=0} f(z)$

1.12 Optimization

Input	Output
<code>\argmin_{x \in S} f(x)</code>	$\arg \min_{x \in S} f(x)$
<code>\argmax_{x \in S} f(x)</code>	$\arg \max_{x \in S} f(x)$
<code>\Order(n)</code>	$O(n)$
<code>\order(n)</code>	$o(n)$

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{$s$ \gets 0}
5   \ForTo{$i = 1$}{$n$}
6     \State{$s$ \gets $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`.

```
1 \Minimize[name={P}]{
2   \sum_{\condit{x \in S}[x^2 = 1]} w(x) + \sum_{i=1}^n (p_i + q_i)
3 }{
4   S \subseteq V, \ \
5   p_i \ge 0 \ \& \ (i = 1, \ldots, n), \ \
6   q_i \ge 0 \ \& \ (i = 1, \ldots, n)
7 }
```

$$(P) \quad \left| \begin{array}{ll} \text{minimize} & \sum_{x \in S: x^2=1} w(x) + \sum_{i=1}^n (p_i + q_i) \\ \text{subject to} & S \subseteq V, \\ & p_i \geq 0 \quad (i = 1, \dots, n), \\ & q_i \geq 0 \quad (i = 1, \dots, n) \end{array} \right.$$