Z Reference Card

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Specifications

Schema box

Name[*Params*]
Declarations
Predicates

```
\begin{schema}{Name}[Params]
  Declarations
\where
  Predicates
\end{schema}
```

Axiomatic description

Declarations
Predicates

```
\begin{axdef}
  Declarations
\where
  Predicates
\end{axdef}
```

Generic definition

[*Params*]
Declarations
Predicates

```
\begin{gendef}[Params]
  Declarations
\where
  Predicates
\end{gendef}
```

`\begin{zed} ...`

Basic type definition

$[NAME, DATE]$ `[NAME, DATE]`

Abbreviation definition

$DOC == \operatorname{seq} CHAR$ `DOC == \seq CHAR`

Constraint

$n\_disks < 5$ `n\_disks < 5`

Schema definition

$Point \mathrel{\widehat=} [\, x, y : \mathbb{Z} \,]$ `Point \defs [~x, y: \num~]`

Free type definition

$Ans ::= ok\langle\langle \mathbb{Z} \rangle\rangle \mid error$ `Ans ::= ok \ldata\num\rdata | error`

`... \end{zed}`

Logic and schema calculus

$true, false$	`true, false`	Logical constants
$\neg P$	`\lnot P`	Negation
$P \land Q$	`P \land Q`	Conjunction
$P \lor Q$	`P \lor Q`	Disjunction
$P \Rightarrow Q$	`P \implies Q`	Implication
$P \Leftrightarrow Q$	`P \iff Q`	Equivalence
$\forall x : T \mid P \bullet Q$	`\forall ...`	Universal quantifier
$\exists x : T \mid P \bullet Q$	`\exists ...`	Existential quantifier
$\exists_1 x : T \mid P \bullet Q$	`\exists_1 ...`	Unique quantifier

Special schema operators

$S[y_1/x_1, y_2/x_2]$	`S[y_1/x_1, y_2/x_2]`	Renaming
$S \setminus (x_1, x_2)$	`S \hide (x_1, x_2)`	Hiding
$S1 \upharpoonright S2$	`S1 \project S2`	Projection
$\operatorname{pre} Op$	`\pre Op`	Pre-condition
$Op1 \fatsemi Op2$	`Op1 \semi Op2`	Sequential composition
$Op1 \gg Op2$	`Op1 \pipe Op2`	Piping

Basic expressions

$x = y$	`x = y`	Equality
$x \neq y$	`x \neq y`	Inequality
if P **then** E_1	`\IF P \THEN E_1`	Conditional
else E_2	`\ELSE E_2`	Expression
θS	`\theta S`	Theta-expression
$E.x$	`E.x`	Selection
$(\mu\, x : T \mid P \bullet E)$	`(\mu x: T | P @ E)`	Mu-expression
$(\mathbf{let}\ x{==}E1 \bullet E2)$	`(\LET x == E1 @ E2)`	Let-expression

Sets

$x \in S$	`x \in S`	Membership
$x \notin S$	`x \notin S`	Non-membership
$\{x_1, \ldots, x_n\}$	`\{x_1, ..., x_n\}`	Set display
$\{\ x : T \mid P \bullet E\ \}$	`\{~x: T | P @ E~\}`	Set comprehension
$\emptyset$	`\emptyset`	Empty set
$S \subseteq T$	`S \subseteq T`	Subset relation
$S \subset T$	`S \subset T`	Proper subset relation
$\mathbb{P}\, S$	`\power S`	Power set
$\mathbb{P}_1\, S$	`\power_1 S`	Non-empty subsets
$S \times T$	`S \cross T`	Cartesian product
(x, y, z)	`(x, y, z)`	Tuple
first p	`first~p`	First of pair
second p	`second~p`	Second of pair
$S \cup T$	`S \cup T`	Set union
$S \cap T$	`S \cap T`	Set intersection
$S \setminus T$	`S \setminus T`	Set difference
$\bigcup A$	`\bigcup A`	Generalized union
$\bigcap A$	`\bigcap A`	Generalized intersection
$\mathbb{F}\, X$	`\finset X`	Finite sets
$\mathbb{F}_1\, X$	`\finset_1 X`	Non-empty finite sets

Relations

$X \leftrightarrow Y$	`X \rel Y`	Binary relations
$x \mapsto y$	`x \mapsto y`	Maplet
$\operatorname{dom} R$	`\dom R`	Domain
$\operatorname{ran} R$	`\ran R`	Range
$\operatorname{id} X$	`\id X`	Identity relation
$Q \mathbin{⨾} R$	`Q \comp R`	Composition
$Q \circ R$	`Q \circ R`	Backwards composition
$S \lhd R$	`S \dres R`	Domain restriction
$R \rhd S$	`R \rres S`	Range restriction
$S \mathbin{⩤} R$	`S \ndres R`	Domain anti-restriction
$R \mathbin{⩥} S$	`R \nrres S`	Range anti-restriction
$R^{\sim}$	`R \inv`	Relational inverse
$R(\!\lvert S \rvert\!)$	`R \limg S\rimg`	Relational image
$Q \oplus R$	`Q \oplus R`	Overriding
R^k	`R^{k}`	Iteration
R^+	`R \plus`	Transitive closure
R^*	`R \star`	Reflexive–trans. closure

Functions

$f(x)$	`f(x)`	Function application
$(\lambda x : T \mid P \bullet E)$	`(\lambda ...)`	Lambda-expression
$X \mathbin{⇸} Y$	`X \pfun Y`	Partial functions
$X \longrightarrow Y$	`X \fun Y`	Total functions
$X \mathbin{⤔} Y$	`X \pinj Y`	Partial injections
$X \rightarrowtail Y$	`X \inj Y`	Total injections
$X \mathbin{⤀} Y$	`X \psurj Y`	Partial surjections
$X \twoheadrightarrow Y$	`X \surj Y`	Total surjections
$X \mathbin{⤖} Y$	`X \bij Y`	Bijections
$X \mathbin{⇻} Y$	`X \ffun Y`	Finite partial functions
$X \mathbin{⤕} Y$	`X \finj Y`	Finite partial injections