Event-B mathematical notation

For each element: its name, its function, its ASCII input in Rodin and its mathematical symbol. P, Q: predicates; E, F: expressions; S, T: sets; r, p, q: relations; f: function; x, y: variables.

Name	Function	ASCII	Symbol
Predicates			
true	predicate that always holds	`true`	$\top$
false	predicate that never holds	`false`	$\bot$
conjunction	P and Q	`P & Q`	$P \land Q$
disjunction	P or Q	`P or Q`	$P \lor Q$
implication	if P then Q	`P => Q`	$P \Rightarrow Q$
equivalence	P if and only if Q	`P <=> Q`	$P \Leftrightarrow Q$
negation	not P	`not P`	$\neg P$
universal quantifier	for every x such that P, Q	`!x.P => Q`	$\forall x \cdot P \Rightarrow Q$
existential quantifier	there is an x such that P and Q	`#x.P & Q`	$\exists x \cdot P \land Q$
equality	E and F have the same value	`E = F`	$E = F$
inequality	E and F have different values	`E /= F`	$E \neq F$
Sets			
membership	E is an element of S	`E : S`	$E \in S$
non-membership	E is not an element of S	`E /: S`	$E \notin S$
subset	every element of S is in T	`S <: T`	$S \subseteq T$
not a subset	negation of $S \subseteq T$	`S /<: T`	$S \not\subseteq T$
proper subset	$S \subseteq T$ and $S \neq T$	`S <<: T`	$S \subset T$
not a proper subset	negation of $S \subset T$	`S /<<: T`	$S \not\subset T$
empty set	set with no element	`{}`	$\varnothing$
set extension	set made of the listed elements	`{a,b,c}`	$\{a, b, c\}$
set comprehension	values of E for the x satisfying P	`{x.P | E}`	$\{x \cdot P \mid E\}$
simple comprehension	elements x satisfying P	`{x | P}`	$\{x \mid P\}$
power set	set of all subsets of S	`POW(S)`	$\mathbb{P}(S)$
non-empty subsets	non-empty subsets of S	`POW1(S)`	$\mathbb{P}_1(S)$
Cartesian product	pairs $x \mapsto y$ with $x \in S$, $y \in T$	`S ** T`	$S \times T$
union	elements of S or of T	`S \/ T`	$S \cup T$
intersection	elements of both S and T	`S /\ T`	$S \cap T$
difference	elements of S not in T	`S \ T`	$S \setminus T$
generalised union	union of the sets in U	`union(U)`	$\mathrm{union}(U)$
generalised intersection	intersection of the sets in U ($U \neq \varnothing$)	`inter(U)`	$\mathrm{inter}(U)$
quantified union	union of the E for the x satisfying P	`UNION x.P | E`	$\bigcup x \cdot P \mid E$
quantified intersection	intersection of the E (some x satisfies P)	`INTER x.P | E`	$\bigcap x \cdot P \mid E$
finiteness	S is a finite set	`finite(S)`	$\mathrm{finite}(S)$
cardinality	number of elements of a finite S	`card(S)`	$\mathrm{card}(S)$
partition	$S = A \cup B$ and $A \cap B = \varnothing$ (generalises)	`partition(S, A,B)`	$\mathit{partition}(S, A, B)$
Numbers			
natural numbers	$\{0, 1, 2, \ldots\}$	`NAT`	$\mathbb{N}$
positive naturals	$\{1, 2, 3, \ldots\}$	`NAT1`	$\mathbb{N}_1$
integers	$\{\ldots, -1, 0, 1, \ldots\}$	`INT`	$\mathbb{Z}$
arithmetic operations	addition, subtraction, multiplication	`x+y x-y x*y`	$x + y \;\; x - y \;\; x * y$
integer division	integer quotient of x by y ($y \neq 0$)	`x / y`	$x \div y$
remainder	remainder of the division ($0 \leq x$, $0 < y$)	`x mod y`	$x \bmod y$
exponentiation	x to the power y ($0 \leq x$, $0 \leq y$)	`x ^ y`	$x \,\hat{}\, y$
interval	integers between a and b	`a .. b`	$a \mathinner{..} b$
comparisons	less, less or equal, greater, greater or equal	`< <= > >=`	$< \leq > \geq$
minimum, maximum	least, greatest element ($S \neq \varnothing$, bounded)	`min(S) max(S)`	$\min(S) \;\; \max(S)$

Name	Function	ASCII	Symbol
successor, predecessor	functions $x \mapsto x+1$ and $x \mapsto x-1$ on $\mathbb{Z}$	`succ pred`	succ pred
Booleans			
set of Booleans	$\{\text{TRUE}, \text{FALSE}\}$	`BOOL`	BOOL
Boolean values	true and false as data values	`TRUE FALSE`	TRUE FALSE
conversion	Boolean value of the predicate P	`bool(P)`	$\text{bool}(P)$
Relations			
maplet (pair)	ordered pair of x and y	`x |-> y`	$x \mapsto y$
relations	set of relations from S to T, $\mathbb{P}(S \times T)$	`S <-> T`	$S \leftrightarrow T$
total relations	relations whose domain is S	`S <<-> T`	$S \nleftrightarrow T$
surjective relations	relations whose range is T	`S <->> T`	$S \twoheadleftarrow T$
total surjective relations	domain S and range T	`S <<->> T`	$S \twoheadleftarrow\!\!\!\!\!\!\rightarrow T$
domain	first elements of the pairs of r	`dom(r)`	$\text{dom}(r)$
range	second elements of the pairs of r	`ran(r)`	$\text{ran}(r)$
identity	relation $\{x \mapsto x\}$; on S: $S \lhd \text{id}$	`id`	id
projections	$x \mapsto y \mapsto x$ and $x \mapsto y \mapsto y$	`prj1 prj2`	prj_1 prj_2
domain restriction	pairs of r whose first element is in S	`S <| r`	$S \lhd r$
domain subtraction	pairs of r whose first element is not in S	`S <<| r`	$S \hookleftarrow r$
range restriction	pairs of r whose second element is in T	`r |> T`	$r \rhd T$
range subtraction	pairs of r whose second element is not in T	`r |>> T`	$r \rightarrowtriangle T$
inverse	pairs of r reversed	`r~`	r^{-1}
relational image	images under r of the elements of S	`r[S]`	$r[S]$
forward composition	p then q	`p ; q`	$p\,;q$
backward composition	q then p ($p \circ q = q\,;p$)	`p circ q`	$p \circ q$
overriding	r with its pairs replaced by those of s on $\text{dom}(s)$	`r <+ s`	$r \hookleftarrow s$
direct product	$\{x \mapsto (y \mapsto z) \mid x \mapsto y \in p \wedge x \mapsto z \in q\}$	`p >< q`	$p \otimes q$
parallel product	$\{(x \mapsto y) \mapsto (z \mapsto t) \mid x \mapsto z \in p \wedge y \mapsto t \in q\}$	`p || q`	$p \parallel q$
Functions			
partial functions	relations where each x has at most one image	`S +-> T`	$S \nrightarrow T$
total functions	partial functions with domain S	`S --> T`	$S \rightarrow T$
partial injections	partial functions whose inverse is a function	`S >+> T`	$S \rightarrowtail T$
total injections	injections with domain S	`S >-> T`	$S \rightarrowtail T$
partial surjections	partial functions with range T	`S +>> T`	$S \twoheadrightarrow T$
total surjections	total functions with range T	`S ->> T`	$S \twoheadrightarrow T$
bijections	total injections that are surjective	`S >->> T`	$S \rightarrowtail\!\!\!\!\!\!\twoheadrightarrow T$
lambda abstraction	function $x \mapsto E$ for the x satisfying P	`%x.P | E`	$\lambda x \cdot P \mid E$
application	image of E under f ($E \in \text{dom}(f)$, f a function)	`f(E)`	$f(E)$
Actions (substitutions)			
assignment	x takes the value of E	`x := E`	$x := E$
set choice	x takes any value in S	`x :: S`	$x :\in S$
choice by predicate	x takes a value x' such that $P(x, x')$	`x :| P`	$x :\mid P$

Remarks. Rodin replaces the ASCII input by the symbol while typing. Partial operators ($f(E)$, $\div$, mod, card, min, max, inter) give rise to well-definedness (WD) obligations. A predicate is read from left to right for WD: $x \in \text{dom}(f) \wedge f(x) > 0$ is well defined, the reverse order is not.