A \LaTeX{} Sample Sheet

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The samples below include most of the mathematical notations used in the assigned chapters of our primary textbook (Introduction to the Theory of Computation) and show, for each notation, what to type into a \LaTeX{} source file in order to produce that notation.

In a few cases, the left-hand column shows the “display style” rendering, which is normally used when the expression appears in a centered display as opposed to running text. For instance, the result of typing

\[
\sum_{0 \leq i \leq n - 1} 2^i
\]

in running text is \(\sum_{0 \leq i \leq n - 1} 2^i\), while the same input, occurring inside a displayed formula, yields

\[
\sum_{0 \leq i \leq n - 1} 2^i
\]

as shown in the table.

These notations should be used in the \LaTeX{} “math mode”—that is, in formulas that are enclosed by \begin{math} ... \end{math}, \( ... \), or $ ... $, or in a displaymath or equation environment.

Although most of these constructions are easy to remember and easy to type, you may want to use \newcommand to define macros for some of them:

\[
\begin{aligned}
\newcommand{\yields}{\stackrel{*}{\Rightarrow}} \\
\newcommand{\functiontype}[3]{#1: #2 \longrightarrow #3}
\end{aligned}
\]

After these definitions, you can type ‘\yields’ to get ‘\(\Rightarrow\)’, and similarly you can type ‘\functiontype{g}{\mathcal{N}}{\mathcal{N}}’ to get ‘\(g : \mathcal{N} \rightarrow \mathcal{N}\)’.

The ‘\subsetneq’ notation requires the use of the American Mathematical Society’s symbol package, \texttt{amssymb}. This means that you will have to add the line

\[
\textbf{1}
\]
\usepackage{amssymb}

after the \documentclass declaration at the beginning of the \LaTeX file in which you use it.

<table>
<thead>
<tr>
<th>Desired output</th>
<th>\LaTeX input</th>
</tr>
</thead>
<tbody>
<tr>
<td>{7, 21, 57}</td>
<td>{7, 21, 57}</td>
</tr>
<tr>
<td>(a \in S)</td>
<td>a \in S</td>
</tr>
<tr>
<td>(a \notin S)</td>
<td>a \notin S</td>
</tr>
<tr>
<td>(A \subseteq B)</td>
<td>A \subseteq B</td>
</tr>
<tr>
<td>(A \subsetneq B)</td>
<td>A \subsetneq B</td>
</tr>
<tr>
<td>(\mathcal{N})</td>
<td>\mathcal{N}</td>
</tr>
<tr>
<td>{1, 2, 3, \ldots}</td>
<td>{1, 2, 3, \ldots}</td>
</tr>
<tr>
<td>(\emptyset)</td>
<td>\emptyset</td>
</tr>
<tr>
<td>({n \mid \text{rule about } n})</td>
<td>{n \mid \text{rule about } n}}</td>
</tr>
<tr>
<td>(k = 0)</td>
<td>k = 0</td>
</tr>
<tr>
<td>(m^2)</td>
<td>m^2</td>
</tr>
<tr>
<td>(A \cup B)</td>
<td>A \cup B</td>
</tr>
<tr>
<td>(A \cap B)</td>
<td>A \cap B</td>
</tr>
<tr>
<td>(\overline{A})</td>
<td>\overline{A}</td>
</tr>
<tr>
<td>(\textsc{start-t})</td>
<td>\textsc{start-t}</td>
</tr>
<tr>
<td>(7, 21, 57)</td>
<td>(7, 21, 57)</td>
</tr>
<tr>
<td>(A \times B)</td>
<td>A \times B</td>
</tr>
<tr>
<td>(A_1)</td>
<td>A_1</td>
</tr>
<tr>
<td>(A_1, A_2, \ldots, A_k)</td>
<td>A_1, A_2, \ldots, A_k</td>
</tr>
<tr>
<td>(A_1 \times A_2 \times \cdots \times A_k)</td>
<td>A_1 \times A_2 \times \cdots \times A_k</td>
</tr>
<tr>
<td>(\underbrace{A \times A \times \cdots \times A}_k)</td>
<td>\underbrace{A \times A \times \cdots \times A}_k</td>
</tr>
</tbody>
</table>
\[ i, j \ge 1 \quad \text{i, j} \geq 1 \]
\[ f(a) = b \quad f(a) = b \]
\[ -x \quad -x \]
\[ \text{abs}(2) \quad \text{\texttt{abs}(2)} \]
\[ f : D \rightarrow R \quad f : D \rightarrow \text{\texttt{rightarrow}} R \]
\[ \mathcal{Z}_m \quad \mathcal{Z}_m \]
\[ m - 1 \quad m - 1 \]
\[ a + b \quad a + b \]
\[ m < n \quad m < n \]
\[ i \equiv j \quad i \equiv_7 j \]
\[ \Sigma \quad \text{\texttt{Sigma}} \]
\[ \Gamma \quad \text{\texttt{Gamma}} \]
\[ \{0, 1\} \quad \{\texttt{0, 1}\} \]
\[ |w| \quad |w| \]
\[ \varepsilon \quad \text{\texttt{varepsilon}} \]
\[ w_1w_2\cdots w_n \quad w_1 w_2 \cdots w_n \]
\[ w^R \quad w^\text{\texttt{R}} \]
\[ \neg P \quad \text{\texttt{neg P}} \]
\[ P \land Q \quad P \land Q \]
\[ P \lor Q \quad P \lor Q \]
\[ P \oplus Q \quad P \oplus Q \]
\[ P \leftrightarrow Q \quad P \leftrightarrow Q \]
\[ P \rightarrow Q \quad P \rightarrow Q \]
\[ P \Rightarrow Q \quad P \Rightarrow Q \]
\[ P \Leftarrow Q \quad P \Leftarrow Q \]
\[ P \Longleftrightarrow Q \quad P \Longleftrightarrow Q \]
\[ k > 0 \quad k > 0 \]
\[ A \cup B \quad A \cup B \]
\[ n/2 \quad n/2 \]
\[ \sqrt{2} \quad \text{\texttt{sqrt}(2)} \]
\[ \frac{m}{n} \]

\[ \mathcal{P} \]

\[ j \leq i \]

\[ 6\% \]

\[ \log_2 n \]

\[ \delta \]

\[ \langle \text{RESET} \rangle \]

\[ q_{\text{even}} \]

\[ \phi_0 \]

\[ A \circ B \]

\[ A' \]

\[ \wp(S) \]

\[ \mathsf{NFA} \]

\[ \Sigma_\varepsilon \]

\[ Q' \]

\[ \bigcup_{r \in R} \delta(r, a) \]

\[ a \neq \varepsilon \]

\[ # \]

\[ S \Rightarrow w \]

\[ A \rightarrow 0A1 | B \]

\[ \tau \]

\[ 6 \cdot x \]

\[ \pm k \frac{c_{\text{max}}}{c_1} \]
$E, \mathcal{E}$

$Q, \mathcal{Q}$

$L, \mathcal{L}$

$B, \mathcal{B}$

$\chi, \chi_A$

$\exists y [\langle x, y \rangle \in D]$

$\left[ \frac{a}{ab} \right]$

$\diamondsuit$

$A \le_m B$

$\forall x [x \ge 0]$

$\phi_1$

$\mathcal{M}$

$\psi$

$\pi$

$K(x)$

$\sum_{0 \le i \le n-1} 2^i$

$\mathcal{R}^+$

$\lim_{n \to \infty} \frac{f(n)}{g(n)}$

$o(n \log \log n)$

$\text{TIME}(t(n))$

$x \leftarrow x \mod y$

$\bigwedge_{1 \le i, j \le n^k} x_{i,j}$
\[ \bigvee_{s \in C} x_{i,j,s} \]
\[ s^{\text{out}} \]
\[ \left\lceil \frac{t}{2} \right\rceil \]
\[ R \uparrow k \]
\[ \Delta \]
\[ \hat{Q} \]
\[ A \subseteq B \]
\[ \Pr[b] \]
\[ \epsilon \]
\[ \max(1, 1/\log a) \]
\[ \mathcal{Z}^+_p \]
\[ b \not\equiv \pm 1 \pmod p \]
\[ \Pi_i \mathcal{P} \]
\[ \tilde{P} \]
\[ N_{M_j} \equiv 0 \]
\[ \max_{m_{j+1}} N_{M_{j+1}} \]
\[ \alpha \wedge \beta \]
\[ \alpha \ast \beta \]
\[ \mathcal{F} \]


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