Mathematical Symbols

Below are brief explanations of some commonly occurring symbols in mathematics presented in more or less haphazard order (the list is not intended to grow so long as to make this irksome).

A word of caution — mathematics has no really fixed rules on what symbols stand for what; never mind that mathematics is supposed to be a highly precise and formal language, reading it relies heavily on contextual information. A Σ might be an algebra; Σ_n might mean the symmetric group; Σ_i is more likely to mean summation! See http://members.aol.com/jeff570/mathsym.html for a valuable introduction to these issues.

Symbol	Meaning	Comments
$\{v \mid C(v)\}$	set definition	$C(v)$ a membership condition on v. E.g. $\{v \mid v \text{ is an odd number}\}$
$\in$	set membership	E.g. $2 \in \{x \mid x \text{ a prime number}\}$ is true; $2 \in \{-1, 0, 1\}$ is false.
$\mathbb{Z}$	integers	$\{\ldots\ -3,\ -2,\ -1,\ 0,\ 1,\ 2,\ 3,\ \ldots\}$, 'Z' is for the German 'Zahlen' (numbers)
$\mathbb{Q}$	rationals	numbers of form a/b for $a, b \in \mathbb{Z}$ 'Q' came from German 'Quotient' (ratio)
$\mathbb{R}$	real numbers	the real line: infinitely many digits after the decimal point allowed
i	$\sqrt{-1}$	*imaginary number* invented to solve $x^2 + 1 = 0$
$\mathbb{C}$	complex numbers	numbers of form $a + ib$, $a, b \in \mathbb{R}, i = \sqrt{-1}$
$\lvert x \rvert$	'size'	Depending on context: 1. for $x \in \mathbb{R}$, the value of x ignoring sign; 2. for $x = a + ib \in \mathbb{C}$, the positive value of $\sqrt{a^2 + b^2}$; 3. for x a set, the cardinality of x

Symbol	Meaning	Comments
$n!$	factorial function	$n! = 1 \times 2 \times \ldots \times (n-1) \times n$ (with $0! = 1! = 1$, by convention)
$\binom{n}{k}$	'n choose k'	ways to choose k numbers from a set of n, given by $\dfrac{n!}{(n-k)!k!}$
$\boldsymbol{\Sigma}$	summation	$\displaystyle\sum_{i=1}^{4} x_i$ means $x_1 + x_2 + x_3 + x_4$
e	$e = 2.7182818285\ldots$	sum of infinite series $\displaystyle\sum_{k=0}^{\infty} 1/k!$
π	'pi' $= 3.1415926536\ldots$	ratio of circumference to diameter in a circle
$\cong$	isomorphism	$X \cong Y$ if X and Y have the same size and structure
$\equiv$	congruence	for integers x, y and r, $x \equiv y \pmod r$ if x and y have the same remainder on division by r
$\aleph_0$	'aleph nought'	1st infinite cardinal: the cardinality of $\mathbb{Z}$ (see Glossary)
$\aleph_1$	'aleph one'	2nd infinite cardinal: assuming the continuum hypothesis, $\aleph_1$ is the cardinality of $\mathbb{R}$ (see Glossary)
$\dfrac{df}{dx}$	derivative of f	the gradiant (instantaneous slope) of function $f(x)$
$\int_a^b f(x)dx$	definite integral of f	area under the curve of f from $x = a$ to $x = b$
$\int f(x)dx$	antiderivative of f	or *indefinite integral*: the function of x whose derivative is $f(x)$
$\cup$	set union	$X \cup Y$ is the set containing everything found in either X or Y
$\cap$	set intersection	$X \cap Y$ is the set containing everything found in both X and Y

Symbol	Meaning	Comments
$x \to y$	'x tends to y'	the distance between x and y is allowed to grow arbitrarily small. E.g. $n \to \infty$.
$f : X \to Y$	function	function f maps set X to set Y
$\chi(G)$	chromatic number	minimum number of colours allowing graph G to be properly coloured (see Glossary)