A Short History of Number Theory

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Berichte aus der Mathematik

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Preface

Mathematics and number theory have their roots in the darkness of history. At least the last 10000 years have seen faster and faster growing developments, which were connected in the beginning with practical requirements. There was a maximum in the golden time of number theory from the 18th until the end of the 19th century. Also in our days, there are found important new ideas and proofs. As a result, there is a vast literature, which an interested person cannot read in his or her life.

This book is only a short summary, which gives a personal view of the author. The history is shown by few chosen examples. The names are normally given in the order of the birthday, generally without personal data, and are representing not only the works of a person but especially the knowledge of that time, school, or university. In most cases, the roots of developments can be seen long before the publication of a conjecture or a proof were available. Examples of older results from the beginning of the disciplines are discussed usually longer than the well known new methods of our days because the former may be also today of interest. The overview is no textbook of number theory but it should enable the reader to find the most important works. The used terminology could only be explained in few cases. The focus is in the beginning all of mathematics and geometry because the principal difficulties, which were seen in former times, are a matter of number theory. The definition of the latter is here very wide and comprises all what is important for understanding, characteristics, calculations, results, and theorems in using numbers (natural numbers, integers, rational numbers, real number symbols, complex numbers, and new constructions following chosen axioms).

I would appreciate discussions, remarks, and hints if there are mistakes.

Leimen, in September 2005 Uwe Kraeft

Choice of symbols

$\Rightarrow, \Leftarrow, \Leftrightarrow$	by this follows (in the given directions)
$\forall$	for all
$\exists$	there is/are
$\in$	is element of (is contained in)
$\cap$	intersection
$A=\{a,b,c\}$	an example of a set A with elements a, b, and c
$-a, b^{-1}, c'$	inverse elements
$\mathbb{N}$	set of natural numbers 1, 2, 3, ...
P	primes of $\mathbb{N}$ 2, 3, 5, ...
$\mathbb{N}^0$	$\mathbb{N}\cup\{0\}$
$\mathbb{N}^-$	$\{-n; n\in\mathbb{N}\}$, set of negative integers -1, -2, -3, ...
$\mathbb{Z}$	$=\mathbb{N}\cup\{\mathbb{N}^-\}\cup\{0\}$, set of integers
$\mathbb{Q}$	set of rational numbers a/b with $a\in\mathbb{Z}$, $b\in\mathbb{N}$
$\mathbb{R}$	set of real number algorithms
$\mathbb{Q}(\mathbb{R})$	$\mathbb{Q}$ or $\mathbb{R}$
$\mathbb{Q}(l)$	adjunction of l to $\mathbb{Q}$
$=$	equal (identical) by axioms or definitions
$\cong$	so near as you want but not identical
$\approx$	about, rounded, can f.e. be approximated for great n
$\equiv$	$a\equiv b \pmod c \Leftrightarrow a\equiv b_c \Leftrightarrow (a-b)/c\in\mathbb{Z}$ for $a,b\in\mathbb{Z}$, $c\in\mathbb{N}$

PT	Pythagorean Triple
FLT	Fermat's Last Theorem
gcd	greatest common divisor
f.e.	for example (e.g.)

Choice of mathematicians who gave contributions to number theory
after www-groups.dcs.st-and.ac.uk/~history/Indexes

about BC

1680-1620 Ahmes
624 - 546 Thales
580 - 520 Pythagoras
490 - 430 Zeno of Elea
470 - 410 Hippocrates
428 - 350 Archytas
428 - 347 Plato
415 - 369 Theaetetus
408 - 355 Eudoxus
384 - 322 Aristotle
325 - 265 Euclid
287 - 212 Archimedes
276 - 197 Eratosthenes
262 - 190 Apollonius

about AD

10 - 75 Heron
60 - 120 Nicomachus
85 - 165 Ptolemy
200 - 284 Diophantus
290 - 350 Pappus
335 - 395 Theon
370 - 415 Hypatia
400 - 460 Sun Zi
411 - 485 Proclus
476 - 550 Aryabhata I
598 - 670 Brahmagupta
735 - 804 Alcuin
790 - 850 al-Khwarizmi
940 -1000 al-Quhi

about AD

1075 - 1160 Adelard
1114 - 1185 Bhaskara II
1114 - 1187 Gherard
1170 - 1250 Fibonacci
1195 - 1256 Sacrobosco
1220 - 1296 Campanus
1225 - 1260 Jordanus
1290 - 1349 Bradwardine
1323 - 1382 Oresme
1401 - 1464 Cusanus
1412 - 1492 Francesca
1445 - 1500 Chuquet
1445 - 1517 Pacioli
1465 - 1526 Ferro
1487 - 1567 Stifel
1492 - 1559 Ries
1500 - 1557 Tartaglia
1501 - 1576 Cardano
1522 - 1565 Ferrari
1526 - 1573 Bombelli
1540 - 1603 Viète
1560 - 1621 Harriot
1581 - 1638 Bachet
1588 - 1648 Mersenne
1596 - 1650 Descartes
1601 - 1665 Fermat
1611 - 1685 Pell
1616 - 1703 Wallis
1623 - 1662 Pascal, Blaise
1630 - 1677 Barrow
1643 - 1727 Newton
1646 - 1716 Leibniz
1656 - 1705 Bernoulli, Jacob

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1667 - 1748	Bernoulli, Johann
1690 - 1764	Goldbach
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1789 - 1857	Cauchy
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1802 - 1829	Abel
1804 - 1851	Jacobi
1805 - 1859	Dirichlet
1805 - 1865	Hamilton, W. R.
1809 - 1882	Liouville
1810 - 1893	Kummer
1811 - 1832	Galois
1814 - 1894	Catalan
1821 - 1894	Chebyshev
1822 - 1901	Hermite
1823 - 1852	Eisenstein
1823 - 1891	Kronecker
1826 - 1866	Riemann
1829 - 1891	Wolstenholme
1831 - 1916	Dedekind
1837 - 1920	Bachmann
1842 - 1891	Lucas
1842 - 1913	Weber, Heinrich
1845 - 1918	Cantor, Georg
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1853 - 1928	Schönflies
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1859 - 1919	Hurwitz
1861 - 1941	Hensel
1862 - 1943	Hilbert
1863 - 1922	Thue
1864 - 1909	Minkowski
1865 - 1963	Hadamard
1866 - 1962	Vallée Poussin
1867 - 1938	Lehmer, D. N.
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1877 - 1947	Hardy
1877 - 1938	Landau
1879 - 1967	Carmichael
1880 - 1975	Perron
1880 - 1950	Fueter
1881 - 1977	Cunningham
1882 - 1935	Noether, Emmy
1885 - 1977	Littlewood
1887 - 1947	Hecke
1887 - 1920	Ramanujan
1888 - 1972	Mordell
1891 - 1983	Vinogradov
1896 - 1981	Siegel
1898 - 1962	Artin
1898 - 1979	Hasse
1903 - 1996	van der Waerden
1905 - 1981	Mazur
1905 - 1991	Lehmer, D. H.
1906 - 2005	Wright
1906 -	Lehmer, Emma
1907 - 1969	Davenport
1913 - 1996	Erdös
1926 -	Serre
1953 -	Wiles
1954 -	Faltings

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