Mathematics Subject Classification 2000

Mathematics Subject Classification 2000 (MSC2000)

This is a completely revised version of the MSC, prepared collaboratively in the editorial offices of MR and Zentralblatt MATH. It replaces the 1991 MSC and is effective (in MR) with the January 2000 issue (2000a).

While in many areas in the MSC there are only very small changes, others have been expanded significantly, and in some areas there is an altogether new classification. The major changes are as follows: Section 04 has been eliminated; 03E will now be used for items previously classified in 04. A new section, 37, has been created for Dynamical systems and ergodic theory; as a result Section 58F has been eliminated. Also in Section 58, 58G has been completely revised and now appears as 58J. The new Section 74, Mechanics of deformable solids, is a completely revised version of Section 73, which has been eliminated. The areas covered by Sections 90 and 92 have been reorganized into Sections 90, 91 and 92. Sections 90B and 90C remain essentially unchanged. The new Section 91A replaces 90D and 91B replaces 90A. The other subsections of 91 replace the old subsections 92G, H, J and K. Sections 92B, C, D, and E remain essentially unchanged. MSC2000 contains a new section, 97, for Mathematics education. This will be used only as a secondary classification in MR. Other sections with significant additions or reorganization include 14, 22, 32, 34, 46, 47, 53, and 65.

To help users of the MSC, conversion tables have been constructed and are available on the AMS web site, www.ams.org. These give, for each 1991 classification that does not appear in MSC2000, the classification(s) in MSC2000 that are most likely to be used for items that would previously have been classified using the old classification, and, for each new classification in MSC2000, the classification(s) in the 1991 MSC that are most likely to have been used earlier for items classified using the new classification.

Instructions for using the Mathematics Subject Classification 2000

These instructions apply uniformly to all fields listed. The main purpose of the classification is to help readers find the items of present or potential interest to them as readily as possible—in MR, in Zbl, or anywhere else where this classification system is used. A paper or book should be listed under the classification where it will receive the broadest attention from readers possibly interested in it—these include both people working in that area and people who are familiar with that area and apply its results and methods elsewhere (inside or outside mathematics). It will be extremely useful for both readers and classifiers to familiarize themselves with the entire classification system and thus to become aware of all the classifications of possible interest to them.

For every paper or book listed, MR chooses precisely one "primary" classification, which is simply the code for the section (MSC entry) in which the item will be located. This section should be the one that covers the principal contribution. When an item contains several principal contributions in different areas, the primary classification should cover the "most important" among them. A paper or book may receive one or several "secondary" classifications (or "cross-references") to cover any remaining principal contributions, ancillary results, motivation or origin of the problems discussed, intended or potential field of application, or other significant aspects worthy of notice.

The "primary" principal contribution is meant to be the one including the most important part of the work actually done in the item under consideration. For example, a paper whose main overall content is the solution of a problem in graph theory, which arose in computer science and whose solution is, say, at present only of interest to computer scientists, belongs primarily in 05C with a cross-reference in 68; conversely, a paper whose overall content lies mainly in computer science should receive a primary classification in 68, even if it makes heavy use of graph theory and proves several new graph-theoretic results along the way.

There are two types of cross-references given after many classifications in the list. The first type is of the form "{For A, see X}"; if this appears in section Y, it means that for contributions described by A one should usually assign the classification X, not Y. The other type of cross-reference merely points out related classifications; it is of the form "[See also ...]", "[See mainly ...]", etc., and the classifications listed in the brackets may, but need not, be added to the classification of a paper, or they may be used in place of the classification where the cross-reference is given. The classifier will have to judge which classification is the most appropriate for the item at hand.

00–XX   GENERAL
- 00–01   Instructional exposition (textbooks, tutorial papers, etc.)
- 00–02   Research exposition (monographs, survey articles)
- **00Axx   General and miscellaneous specific topics**
- 00A05   General mathematics
- 00A06   Mathematics for nonmathematicians (engineering, social sciences, etc.)
- 00A07   Problem books
- 00A08   Recreational mathematics [See also 97A20]
- 00A15   Bibliographies
- 00A17   External book reviews
- 00A20   Dictionaries and other general reference works
- 00A22   Formularies
- 00A30   Philosophy of mathematics [See also 03A05]
- 00A35   Methodology of mathematics, didactics [See also 97Cxx, 97Dxx]
- 00A69   General applied mathematics {For physics, see 00A79 and Sections 70 through 86}
- 00A71   Theory of mathematical modeling
- 00A72   General methods of simulation
- 00A73   Dimensional analysis
- 00A79   Physics (use more specific entries from Sections 70 through 86 when possible)

00A99 Miscellaneous topics

00Bxx **Conference proceedings and collections of papers**

00B05 Collections of abstracts of lectures

00B10 Collections of articles of general interest

00B15 Collections of articles of miscellaneous specific content

00B20 Proceedings of conferences of general interest

00B25 Proceedings of conferences of miscellaneous specific interest

00B30 Festschriften

00B50 Volumes of selected translations

00B55 Miscellaneous volumes of translations

00B60 Collections of reprinted articles [See also 01A75]

01–XX **HISTORY AND BIOGRAPHY [See also the classification number –03 in the other sections]**

01–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

01–01 Instructional exposition (textbooks, tutorial papers, etc.)

01–02 Research exposition (monographs, survey articles)

01–06 Proceedings, conferences, collections, etc.

01–08 Computational methods

01Axx **History of mathematics and mathematicians**

01A05 General histories, source books

01A07 Ethnomathematics, general

01A10 Paleolithic, Neolithic

01A12 Indigenous cultures of the Americas

01A13 Other indigenous cultures (non-European)

01A15 Indigenous European cultures (pre-Greek, etc.)

01A16 Egyptian

01A17 Babylonian

01A20 Greek, Roman

01A25 China

01A27 Japan

01A29 Southeast Asia

01A30 Islam (Medieval)

01A32 India

01A35 Medieval

01A40 15th and 16th centuries, Renaissance

01A45 17th century

01A50 18th century

01A55 19th century

01A60 20th century

01A61 Twenty-first century

01A65 Contemporary

01A67 Future prospectives

01A70 Biographies, obituaries, personalia, bibliographies

01A72 Schools of mathematics

01A73 Universities

01A74 Other institutions and academies

01A75 Collected or selected works; reprintings or translations of classics [See also 00B60]

01A80 Sociology (and profession) of mathematics

01A85 Historiography

01A90 Bibliographic studies

01A99 Miscellaneous topics

03–XX **MATHEMATICAL LOGIC AND FOUNDATIONS**

03–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

03–01 Instructional exposition (textbooks, tutorial papers, etc.)

03–02 Research exposition (monographs, survey articles)

03–03 Historical (must also be assigned at least one classification number from Section 01)

03–04 Explicit machine computation and programs (not the theory of computation or programming)

03–06 Proceedings, conferences, collections, etc.

03A05 **Philosophical and critical {For philosophy of mathematics, see also 00A30}**

03Bxx **General logic**

03B05 Classical propositional logic

03B10 Classical first-order logic

03B15 Higher-order logic and type theory

03B20 Subsystems of classical logic (including intuitionistic logic)

03B22 Abstract deductive systems

03B25 Decidability of theories and sets of sentences [See also 11U05, 12L05, 20F10]

03B30 Foundations of classical theories (including reverse mathematics) [See also 03F35]

03B35 Mechanization of proofs and logical operations [See also 68T15]

03B40 Combinatory logic and lambda-calculus [See also 68N18]

03B42 Logic of knowledge and belief

03B44 Temporal logic

03B45 Modal logic {For knowledge and belief see 03B42; for temporal logic see 03B44; for provability logic see also 03F45}

03B47 Substructural logics (including relevance, entailment, linear logic, Lambek calculus, BCK and BCI logics) {For proof-theoretic aspects see 03F52}

03B48 Probability and inductive logic [See also 60A05]

03B50 Many-valued logic

03B52 Fuzzy logic; logic of vagueness [See also 68T27, 68T37, 94D05]

03B53 Logics admitting inconsistency (paraconsistent logics, discussive logics, etc.)

03B55 Intermediate logics

03B60 Other nonclassical logic

03B65 Logic of natural languages [See also 68T50, 91F20]

03B70 Logic in computer science [See also 68–XX]

03B80 Other applications of logic

03B99 None of the above, but in this section

03Cxx **Model theory**

03C05 Equational classes, universal algebra [See also 08Axx, 08Bxx, 18C05]

03C07 Basic properties of first-order languages and structures

03C10 Quantifier elimination, model completeness and related topics

03C13 Finite structures [See also 68Q15, 68Q19]
03C15 Denumerable structures
03C20 Ultraproducts and related constructions
03C25 Model-theoretic forcing
03C30 Other model constructions
03C35 Categoricity and completeness of theories
03C40 Interpolation, preservation, definability
03C45 Classification theory, stability and related concepts
03C50 Models with special properties (saturated, rigid, etc.)
03C52 Properties of classes of models
03C55 Set-theoretic model theory
03C57 Effective and recursion-theoretic model theory [See also 03D45]
03C60 Model-theoretic algebra [See also 08C10, 12Lxx, 13L05]
03C62 Models of arithmetic and set theory [See also 03Hxx]
03C64 Model theory of ordered structures; o-minimality
03C65 Models of other mathematical theories
03C68 Other classical first-order model theory
03C70 Logic on admissible sets
03C75 Other infinitary logic
03C80 Logic with extra quantifiers and operators [See also 03B42, 03B44, 03B45, 03B48]
03C85 Second- and higher-order model theory
03C90 Nonclassical models (Boolean-valued, sheaf, etc.)
03C95 Abstract model theory
03C98 Applications of model theory [See also 03C60]
03C99 None of the above, but in this section
03Dxx **Computability and recursion theory**
03D03 Thue and Post systems, etc.
03D05 Automata and formal grammars in connection with logical questions [See also 68Q45, 68Q70, 68R15]
03D10 Turing machines and related notions [See also 68Q05]
03D15 Complexity of computation [See also 68Q15, 68Q17]
03D20 Recursive functions and relations, subrecursive hierarchies
03D25 Recursively (computably) enumerable sets and degrees
03D28 Other Turing degree structures
03D30 Other degrees and reducibilities
03D35 Undecidability and degrees of sets of sentences
03D40 Word problems, etc. [See also 06B25, 08A50, 20F10, 68R15]
03D45 Theory of numerations, effectively presented structures [See also 03C57; for intuitionistic and similar approaches see 03F55]
03D50 Recursive equivalence types of sets and structures, isols
03D55 Hierarchies
03D60 Computability and recursion theory on ordinals, admissible sets, etc.
03D65 Higher-type and set recursion theory

03D70 Inductive definability
03D75 Abstract and axiomatic computability and recursion theory
03D80 Applications of computability and recursion theory
03D99 None of the above, but in this section
03Exx **Set theory**
03E02 Partition relations
03E04 Ordered sets and their cofinalities; pcf theory
03E05 Other combinatorial set theory
03E10 Ordinal and cardinal numbers
03E15 Descriptive set theory [See also 28A05, 54H05]
03E17 Cardinal characteristics of the continuum
03E20 Other classical set theory (including functions, relations, and set algebra)
03E25 Axiom of choice and related propositions
03E30 Axiomatics of classical set theory and its fragments
03E35 Consistency and independence results
03E40 Other aspects of forcing and Boolean-valued models
03E45 Inner models, including constructibility, ordinal definability, and core models
03E47 Other notions of set-theoretic definability
03E50 Continuum hypothesis and Martin's axiom
03E55 Large cardinals
03E60 Determinacy principles
03E65 Other hypotheses and axioms
03E70 Nonclassical and second-order set theories
03E72 Fuzzy set theory
03E75 Applications of set theory
03E99 None of the above, but in this section
03Fxx **Proof theory and constructive mathematics**
03F03 Proof theory, general
03F05 Cut-elimination and normal-form theorems
03F07 Structure of proofs
03F10 Functionals in proof theory
03F15 Recursive ordinals and ordinal notations
03F20 Complexity of proofs
03F25 Relative consistency and interpretations
03F30 First-order arithmetic and fragments
03F35 Second- and higher-order arithmetic and fragments [See also 03B30]
03F40 Gödel numberings in proof theory
03F45 Provability logics and related algebras (e.g., diagonalizable algebras) [See also 03B45, 03G25, 06E25]
03F50 Metamathematics of constructive systems
03F52 Linear logic and other substructural logics [See also 03B47]
03F55 Intuitionistic mathematics
03F60 Constructive and recursive analysis [See also 03B30, 03D45, 26E40, 46S30, 47S30]
03F65 Other constructive mathematics [See also 03D45]
03F99 None of the above, but in this section
03Gxx **Algebraic logic**
03G05 Boolean algebras [See also 06Exx]
03G10 Lattices and related structures [See also 06Bxx]

03G12 Quantum logic [See also 06C15, 81P10]
03G15 Cylindric and polyadic algebras; relation algebras
03G20 Łukasiewicz and Post algebras [See also 06D25, 06D30]
03G25 Other algebras related to logic [See also 03F45, 06D20, 06E25, 06F35]
03G30 Categorical logic, topoi [See also 18B25, 18C05, 18C10]
03G99 None of the above, but in this section
03Hxx **Nonstandard models [See also 03C62]**
03H05 Nonstandard models in mathematics [See also 26E35, 28E05, 30G06, 46S20, 47S20, 54J05]
03H10 Other applications of nonstandard models (economics, physics, etc.)
03H15 Nonstandard models of arithmetic [See also 11U10, 12L15, 13L05]
03H99 None of the above, but in this section
05–XX **COMBINATORICS {For finite fields, see 11Txx}**
05–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
05–01 Instructional exposition (textbooks, tutorial papers, etc.)
05–02 Research exposition (monographs, survey articles)
05–03 Historical (must also be assigned at least one classification number from Section 01)
05–04 Explicit machine computation and programs (not the theory of computation or programming)
05–06 Proceedings, conferences, collections, etc.
05Axx **Enumerative combinatorics**
05A05 Combinatorial choice problems (subsets, representatives, permutations)
05A10 Factorials, binomial coefficients, combinatorial functions [See also 11B65, 33Cxx]
05A15 Exact enumeration problems, generating functions [See also 33Cxx, 33Dxx]
05A16 Asymptotic enumeration
05A17 Partitions of integers [See also 11P81, 11P82, 11P83]
05A18 Partitions of sets
05A19 Combinatorial identities
05A20 Combinatorial inequalities
05A30 q-calculus and related topics [See also 03Dxx]
05A40 Umbral calculus
05A99 None of the above, but in this section
05Bxx **Designs and configurations {For applications of design theory, see 94C30}**
05B05 Block designs [See also 51E05, 62K10]
05B07 Triple systems
05B10 Difference sets (number-theoretic, group-theoretic, etc.) [See also 11B13]
05B15 Orthogonal arrays, Latin squares, Room squares
05B20 Matrices (incidence, Hadamard, etc.)
05B25 Finite geometries [See also 51D20, 51Exx]
05B30 Other designs, configurations [See also 51E30]

05B35 Matroids, geometric lattices [See also 52B40, 90C27]
05B40 Packing and covering [See also 11H31, 52C15, 52C17]
05B45 Tessellation and tiling problems [See also 52C20, 52C22]
05B50 Polyominoes
05B99 None of the above, but in this section
05Cxx **Graph theory {For applications of graphs, see 68R10, 90C35, 94C15}**
05C05 Trees
05C07 Degree sequences
05C10 Topological graph theory, imbedding [See also 57M15, 57M25]
05C12 Distance in graphs
05C15 Coloring of graphs and hypergraphs
05C17 Perfect graphs
05C20 Directed graphs (digraphs), tournaments
05C22 Signed, gain and biased graphs
05C25 Graphs and groups [See also 20F65]
05C30 Enumeration of graphs and maps
05C35 Extremal problems [See also 90C35]
05C38 Paths and cycles [See also 90B10]
05C40 Connectivity
05C45 Eulerian and Hamiltonian graphs
05C50 Graphs and matrices
05C55 Generalized Ramsey theory
05C60 Isomorphism problems (reconstruction conjecture, etc.)
05C62 Graph representations (geometric and intersection representations, etc.)
05C65 Hypergraphs
05C69 Dominating sets, independent sets, cliques
05C70 Factorization, matching, covering and packing
05C75 Structural characterization of types of graphs
05C78 Graph labelling (graceful graphs, bandwidth, etc.)
05C80 Random graphs
05C83 Graph minors
05C85 Graph algorithms [See also 68R10, 68W05]
05C90 Applications
05C99 None of the above, but in this section
05Dxx **Extremal combinatorics**
05D05 Extremal set theory
05D10 Ramsey theory
05D15 Transversal (matching) theory
05D40 Probabilistic methods
05D99 None of the above, but in this section
05Exx **Algebraic combinatorics**
05E05 Symmetric functions
05E10 Tableaux, representations of the symmetric group [See also 20C30]
05E15 Combinatorial problems concerning the classical groups [See also 22E45, 33C80]
05E20 Group actions on designs, geometries and codes
05E25 Group actions on posets and homology groups of posets [See also 06A11]
05E30 Association schemes, strongly regular graphs

05E35 Orthogonal polynomials [See also 33C45, 33C50, 33D45]

05E99 None of the above, but in this section

06–XX ORDER, LATTICES, ORDERED ALGEBRAIC STRUCTURES [See also 18B35]

06–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

06–01 Instructional exposition (textbooks, tutorial papers, etc.)

06–02 Research exposition (monographs, survey articles)

06–03 Historical (must also be assigned at least one classification number from Section 01)

06–04 Explicit machine computation and programs (not the theory of computation or programming)

06–06 Proceedings, conferences, collections, etc.

06Axx Ordered sets

06A05 Total order

06A06 Partial order, general

06A07 Combinatorics of partially ordered sets

06A11 Algebraic aspects of posets [See also 05E25]

06A12 Semilattices [See also 20M10; for topological semilattices see 22A26]

06A15 Galois correspondences, closure operators

06A99 None of the above, but in this section

06Bxx Lattices [See also 03G10]

06B05 Structure theory

06B10 Ideals, congruence relations

06B15 Representation theory

06B20 Varieties of lattices

06B23 Complete lattices, completions

06B25 Free lattices, projective lattices, word problems [See also 03D40, 08A50, 20F10]

06B30 Topological lattices, order topologies [See also 06F30, 22A26, 54F05, 54H12]

06B35 Continuous lattices and posets, applications [See also 06B30, 06D10, 06F30, 18B35, 22A26, 68Q55]

06B99 None of the above, but in this section

06Cxx Modular lattices, complemented lattices

06C05 Modular lattices, Desarguesian lattices

06C10 Semimodular lattices, geometric lattices

06C15 Complemented lattices, orthocomplemented lattices and posets [See also 03G12, 81P10]

06C20 Complemented modular lattices, continuous geometries

06C99 None of the above, but in this section

06Dxx Distributive lattices

06D05 Structure and representation theory

06D10 Complete distributivity

06D15 Pseudocomplemented lattices

06D20 Heyting algebras [See also 03G25]

06D22 Frames, locales {For topological questions see 54–XX}

06D25 Post algebras [See also 03G20]

06D30 De Morgan algebras, Łukasiewicz algebras [See also 03G20]

06D35 MV-algebras

06D50 Lattices and duality

06D72 Fuzzy lattices (soft algebras) and related topics

06D99 None of the above, but in this section

06Exx Boolean algebras (Boolean rings) [See also 03G05]

06E05 Structure theory

06E10 Chain conditions, complete algebras

06E15 Stone space and related constructions

06E20 Ring-theoretic properties [See also 16E50, 16G30]

06E25 Boolean algebras with additional operations (diagonalizable algebras, etc.) [See also 03G25, 03F45]

06E30 Boolean functions [See also 94C10]

06E99 None of the above, but in this section

06Fxx Ordered structures

06F05 Ordered semigroups and monoids [See also 20Mxx]

06F07 Quantales

06F10 Noether lattices

06F15 Ordered groups [See also 20F60]

06F20 Ordered abelian groups, Riesz groups, ordered linear spaces [See also 46A40]

06F25 Ordered rings, algebras, modules {For ordered fields, see 12J15; see also 13J25, 16W80}

06F30 Topological lattices, order topologies [See also 06B30, 22A26, 54F05, 54H12]

06F35 BCK-algebras, BCI-algebras [See also 03G25]

06F99 None of the above, but in this section

08–XX GENERAL ALGEBRAIC SYSTEMS

08–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

08–01 Instructional exposition (textbooks, tutorial papers, etc.)

08–02 Research exposition (monographs, survey articles)

08–03 Historical (must also be assigned at least one classification number from Section 01)

08–04 Explicit machine computation and programs (not the theory of computation or programming)

08–06 Proceedings, conferences, collections, etc.

08Axx Algebraic structures [See also 03C05]

08A02 Relational systems, laws of composition

08A05 Structure theory

08A30 Subalgebras, congruence relations

08A35 Automorphisms, endomorphisms

08A40 Operations, polynomials, primal algebras

08A45 Equational compactness

08A50 Word problems [See also 03D40, 06B25, 20F10, 68R15]

08A55 Partial algebras

08A60 Unary algebras

08A62 Finitary algebras

08A65 Infinitary algebras

08A68 Heterogeneous algebras

08A70 Applications of universal algebra in computer science

08A72 Fuzzy algebraic structures

08A99 None of the above, but in this section

08Bxx Varieties [See also 03C05]
08B05 Equational logic, Mal′cev (Mal′tsev) conditions
08B10 Congruence modularity, congruence distributivity
08B15 Lattices of varieties
08B20 Free algebras
08B25 Products, amalgamated products, and other kinds of limits and colimits [See also 18A30]
08B26 Subdirect products and subdirect irreducibility
08B30 Injectives, projectives
08B99 None of the above, but in this section

08Cxx Other classes of algebras
08C05 Categories of algebras [See also 18C05]
08C10 Axiomatic model classes [See also 03Cxx, in particular 03C60]
08C15 Quasivarieties
08C99 None of the above, but in this section

11–XX NUMBER THEORY
11–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
11–01 Instructional exposition (textbooks, tutorial papers, etc.)
11–02 Research exposition (monographs, survey articles)
11–03 Historical (must also be assigned at least one classification number from Section 01)
11–04 Explicit machine computation and programs (not the theory of computation or programming)
11–06 Proceedings, conferences, collections, etc.

11Axx Elementary number theory {For analogues in number fields, see 11R04}
11A05 Multiplicative structure; Euclidean algorithm; greatest common divisors
11A07 Congruences; primitive roots; residue systems
11A15 Power residues, reciprocity
11A25 Arithmetic functions; related numbers; inversion formulas
11A41 Primes
11A51 Factorization; primality
11A55 Continued fractions {For approximation results, see 11J70} [See also 11K50, 30B70, 40A15]
11A63 Radix representation; digital problems {For metric results, see 11K16}
11A67 Other representations
11A99 None of the above, but in this section

11Bxx Sequences and sets
11B05 Density, gaps, topology
11B13 Additive bases [See also 05B10]
11B25 Arithmetic progressions [See also 11N13]
11B34 Representation functions
11B37 Recurrences {For applications to special functions, see 33–XX}
11B39 Fibonacci and Lucas numbers and polynomials and generalizations
11B50 Sequences (mod m)
11B57 Farey sequences; the sequences $1^k, 2^k, \cdots$
11B65 Binomial coefficients; factorials; q-identities [See also 05A10, 05A30]

11B68 Bernoulli and Euler numbers and polynomials
11B73 Bell and Stirling numbers
11B75 Other combinatorial number theory
11B83 Special sequences and polynomials
11B85 Automata sequences
11B99 None of the above, but in this section

11Cxx Polynomials and matrices
11C08 Polynomials [See also 13F20]
11C20 Matrices, determinants [See also 15A36]
11C99 None of the above, but in this section

11Dxx Diophantine equations [See also 11Gxx, 14Gxx]
11D04 Linear equations
11D09 Quadratic and bilinear equations
11D25 Cubic and quartic equations
11D41 Higher degree equations; Fermat's equation
11D45 Counting solutions of Diophantine equations
11D57 Multiplicative and norm form equations
11D59 Thue-Mahler equations
11D61 Exponential equations
11D68 Rational numbers as sums of fractions
11D72 Equations in many variables [See also 11P55]
11D75 Diophantine inequalities [See also 11J25]
11D79 Congruences in many variables
11D85 Representation problems [See also 11P55]
11D88 p-adic and power series fields
11D99 None of the above, but in this section

11Exx Forms and linear algebraic groups [See also 19Gxx] {For quadratic forms in linear algebra, see 15A63}
11E04 Quadratic forms over general fields
11E08 Quadratic forms over local rings and fields
11E10 Forms over real fields
11E12 Quadratic forms over global rings and fields
11E16 General binary quadratic forms
11E20 General ternary and quaternary quadratic forms; forms of more than two variables
11E25 Sums of squares and representations by other particular quadratic forms
11E39 Bilinear and Hermitian forms
11E41 Class numbers of quadratic and Hermitian forms
11E45 Analytic theory (Epstein zeta functions; relations with automorphic forms and functions)
11E57 Classical groups [See also 14Lxx, 20Gxx]
11E70 K-theory of quadratic and Hermitian forms
11E72 Galois cohomology of linear algebraic groups [See also 20G10]
11E76 Forms of degree higher than two
11E81 Algebraic theory of quadratic forms; Witt groups and rings [See also 19G12, 19G24]
11E88 Quadratic spaces; Clifford algebras [See also 15A63, 15A66]
11E95 p-adic theory
11E99 None of the above, but in this section

11Fxx   **Discontinuous groups and automorphic forms [See also 11R39, 11S37, 14Gxx, 14Kxx, 22E50, 22E55, 30F35, 32Nxx] {For relations with quadratic forms, see 11E45}**

11F03   Modular and automorphic functions

11F06   Structure of modular groups and generalizations; arithmetic groups [See also 20H05, 20H10, 22E40]

11F11   Modular forms, one variable

11F12   Automorphic forms, one variable

11F20   Dedekind eta function, Dedekind sums

11F22   Relationship to Lie algebras and finite simple groups

11F23   Relations with algebraic geometry and topology

11F25   Hecke-Petersson operators, differential operators (one variable)

11F27   Theta series; Weil representation

11F30   Fourier coefficients of automorphic forms

11F32   Modular correspondences, etc.

11F33   Congruences for modular and p-adic modular forms [See also 14G20, 22E50]

11F37   Forms of half-integer weight; nonholomorphic modular forms

11F41   Hilbert and Hilbert-Siegel modular groups and their modular and automorphic forms; Hilbert modular surfaces [See also 14J20]

11F46   Siegel modular groups and their modular and automorphic forms

11F50   Jacobi forms

11F52   Modular forms associated to Drinfel′d modules

11F55   Other groups and their modular and automorphic forms (several variables)

11F60   Hecke-Petersson operators, differential operators (several variables)

11F66   Dirichlet series and functional equations in connection with modular forms

11F67   Special values of automorphic L-series, periods of modular forms, cohomology, modular symbols

11F70   Representation-theoretic methods; automorphic representations over local and global fields

11F72   Spectral theory; Selberg trace formula

11F75   Cohomology of arithmetic groups

11F80   Galois representations

11F85 p-adic theory, local fields [See also 14G20, 22E50]

11F99   None of the above, but in this section

11Gxx   **Arithmetic algebraic geometry (Diophantine geometry) [See also 11Dxx, 14Gxx, 14Kxx]**

11G05   Elliptic curves over global fields [See also 14H52]

11G07   Elliptic curves over local fields [See also 14G20, 14H52]

11G09   Drinfel′d modules; higher-dimensional motives, etc. [See also 14L05]

11G10   Abelian varieties of dimension > 1 [See also 14Kxx]

11G15   Complex multiplication and moduli of abelian varieties [See also 14K22]

11G16   Elliptic and modular units [See also 11R27]

11G18   Arithmetic aspects of modular and Shimura varieties [See also 14G35]

11G20   Curves over finite and local fields [See also 14H25]

11G25   Varieties over finite and local fields [See also 14G15, 14G20]

11G30   Curves of arbitrary genus or genus $\neq 1$ over global fields [See also 14H25]

11G35   Varieties over global fields [See also 14G25]

11G40 L-functions of varieties over global fields; Birch-Swinnerton-Dyer conjecture [See also 14G10]

11G45   Geometric class field theory [See also 11R37, 14C35, 19F05]

11G50   Heights [See also 14G40]

11G55   Polylogarithms and relations with K-theory

11G99   None of the above, but in this section

11Hxx   **Geometry of numbers {For applications in coding theory, see 94B75}**

11H06   Lattices and convex bodies [See also 11P21, 52C05, 52C07]

11H16   Nonconvex bodies

11H31   Lattice packing and covering [See also 05B40, 52C15, 52C17]

11H46   Products of linear forms

11H50   Minima of forms

11H55   Quadratic forms (reduction theory, extreme forms, etc.)

11H56   Automorphism groups of lattices

11H60   Mean value and transfer theorems

11H71   Relations with coding theory

11H99   None of the above, but in this section

11Jxx   **Diophantine approximation, transcendental number theory [See also 11K60]**

11J04   Homogeneous approximation to one number

11J06   Markov and Lagrange spectra and generalizations

11J13   Simultaneous homogeneous approximation, linear forms

11J17   Approximation by numbers from a fixed field

11J20   Inhomogeneous linear forms

11J25   Diophantine inequalities [See also 11D75]

11J54   Small fractional parts of polynomials and generalizations

11J61   Approximation in non-Archimedean valuations

11J68   Approximation to algebraic numbers

11J70   Continued fractions and generalizations [See also 11A55, 11K50]

11J71   Distribution modulo one [See also 11K06]

11J72   Irrationality; linear independence over a field

11J81   Transcendence (general theory)

11J82   Measures of irrationality and of transcendence

11J83   Metric theory

11J85   Algebraic independence; Gel′fond's method

11J86   Linear forms in logarithms; Baker's method

11J89   Transcendence theory of elliptic and abelian functions

11J91   Transcendence theory of other special functions

11J93   Transcendence theory of Drinfel′d and t-modules

11J95	Results involving abelian varieties
11J97	Analogues of methods in Nevanlinna theory (work of Vojta et al.)
11J99	None of the above, but in this section
11Kxx	**Probabilistic theory: distribution modulo** 1; **metric theory of algorithms**
11K06	General theory of distribution modulo 1 [See also 11J71]
11K16	Normal numbers, radix expansions, etc. [See also 11A63]
11K31	Special sequences
11K36	Well-distributed sequences and other variations
11K38	Irregularities of distribution, discrepancy [See also 11Nxx]
11K41	Continuous, p-adic and abstract analogues
11K45	Pseudo-random numbers; Monte Carlo methods
11K50	Metric theory of continued fractions [See also 11A55, 11J70]
11K55	Metric theory of other algorithms and expansions; measure and Hausdorff dimension [See also 11N99, 28Dxx]
11K60	Diophantine approximation [See also 11Jxx]
11K65	Arithmetic functions [See also 11Nxx]
11K70	Harmonic analysis and almost periodicity
11K99	None of the above, but in this section
11Lxx	**Exponential sums and character sums** {**For finite fields, see 11Txx**}
11L03	Trigonometric and exponential sums, general
11L05	Gauss and Kloosterman sums; generalizations
11L07	Estimates on exponential sums
11L10	Jacobsthal and Brewer sums; other complete character sums
11L15	Weyl sums
11L20	Sums over primes
11L26	Sums over arbitrary intervals
11L40	Estimates on character sums
11L99	None of the above, but in this section
11Mxx	**Zeta and L-functions: analytic theory**
11M06	$\zeta(s)$ and $L(s, \chi)$
11M20	Real zeros of $L(s, \chi)$; results on $L(1, \chi)$
11M26	Nonreal zeros of $\zeta(s)$ and $L(s, \chi)$; Riemann and other hypotheses
11M35	Hurwitz and Lerch zeta functions
11M36	Selberg zeta functions and regularized determinants; applications to spectral theory, Dirichlet series, Eisenstein series, etc. Explicit formulas
11M38	Zeta and L-functions in characteristic p
11M41	Other Dirichlet series and zeta functions {For local and global ground fields, see 11R42, 11R52, 11S40, 11S45; for algebro-geometric methods, see 14G10; see also 11E45, 11F66, 11F70, 11F72}
11M45	Tauberian theorems [See also 40E05]
11M99	None of the above, but in this section
11Nxx	**Multiplicative number theory**
11N05	Distribution of primes
11N13	Primes in progressions [See also 11B25]

11N25	Distribution of integers with specified multiplicative constraints
11N30	Turán theory [See also 30Bxx]
11N32	Primes represented by polynomials; other multiplicative structure of polynomial values
11N35	Sieves
11N36	Applications of sieve methods
11N37	Asymptotic results on arithmetic functions
11N45	Asymptotic results on counting functions for algebraic and topological structures
11N56	Rate of growth of arithmetic functions
11N60	Distribution functions associated with additive and positive multiplicative functions
11N64	Other results on the distribution of values or the characterization of arithmetic functions
11N69	Distribution of integers in special residue classes
11N75	Applications of automorphic functions and forms to multiplicative problems [See also 11Fxx]
11N80	Generalized primes and integers
11N99	None of the above, but in this section
11Pxx	**Additive number theory; partitions**
11P05	Waring's problem and variants
11P21	Lattice points in specified regions
11P32	Goldbach-type theorems; other additive questions involving primes
11P55	Applications of the Hardy-Littlewood method [See also 11D85]
11P70	Inverse problems of additive number theory
11P81	Elementary theory of partitions [See also 05A17]
11P82	Analytic theory of partitions
11P83	Partitions; congruences and congruential restrictions
11P99	None of the above, but in this section
11Rxx	**Algebraic number theory: global fields** {**For complex multiplication, see 11G15**}
11R04	Algebraic numbers; rings of algebraic integers
11R06	PV-numbers and generalizations; other special algebraic numbers
11R09	Polynomials (irreducibility, etc.)
11R11	Quadratic extensions
11R16	Cubic and quartic extensions
11R18	Cyclotomic extensions
11R20	Other abelian and metabelian extensions
11R21	Other number fields
11R23	Iwasawa theory
11R27	Units and factorization
11R29	Class numbers, class groups, discriminants
11R32	Galois theory
11R33	Integral representations related to algebraic numbers; Galois module structure of rings of integers [See also 20C10]
11R34	Galois cohomology [See also 12Gxx, 16H05, 19A31]
11R37	Class field theory
11R39	Langlands-Weil conjectures, nonabelian class field theory [See also 11Fxx, 22E55]
11R42	Zeta functions and L-functions of number fields [See also 11M41, 19F27]

11R44	Distribution of prime ideals [See also 11N05]
11R45	Density theorems
11R47	Other analytic theory [See also 11Nxx]
11R52	Quaternion and other division algebras: arithmetic, zeta functions
11R54	Other algebras and orders, and their zeta and L-functions [See also 11S45, 16H05, 16Kxx]
11R56	Adèle rings and groups
11R58	Arithmetic theory of algebraic function fields [See also 14–XX]
11R60	Cyclotomic function fields (class groups, Bernoulli objects, etc.)
11R65	Class groups and Picard groups of orders
11R70	K-theory of global fields [See also 19Fxx]
11R80	Totally real and totally positive fields [See also 12J15]
11R99	None of the above, but in this section
11Sxx	**Algebraic number theory: local and p-adic fields**
11S05	Polynomials
11S15	Ramification and extension theory
11S20	Galois theory
11S23	Integral representations
11S25	Galois cohomology [See also 12Gxx, 16H05]
11S31	Class field theory; p-adic formal groups [See also 14L05]
11S37	Langlands-Weil conjectures, nonabelian class field theory [See also 11Fxx, 22E50]
11S40	Zeta functions and L-functions [See also 11M41, 19F27]
11S45	Algebras and orders, and their zeta functions [See also 11R52, 11R54, 16H05, 16Kxx]
11S70	K-theory of local fields [See also 19Fxx]
11S80	Other analytic theory (analogues of beta and gamma functions, p-adic integration, etc.)
11S85	Other nonanalytic theory
11S90	Prehomogeneous vector spaces
11S99	None of the above, but in this section
11Txx	**Finite fields and commutative rings (number-theoretic aspects)**
11T06	Polynomials
11T22	Cyclotomy
11T23	Exponential sums
11T24	Other character sums and Gauss sums
11T30	Structure theory
11T55	Arithmetic theory of polynomial rings over finite fields
11T60	Finite upper half-planes
11T71	Algebraic coding theory; cryptography
11T99	None of the above, but in this section
11Uxx	**Connections with logic**
11U05	Decidability [See also 03B25]
11U07	Ultraproducts [See also 03C20]
11U09	Model theory [See also 03Cxx]
11U10	Nonstandard arithmetic [See also 03H15]
11U99	None of the above, but in this section

11Yxx	**Computational number theory [See also 11–04]**
11Y05	Factorization
11Y11	Primality
11Y16	Algorithms; complexity [See also 68Q25]
11Y35	Analytic computations
11Y40	Algebraic number theory computations
11Y50	Computer solution of Diophantine equations
11Y55	Calculation of integer sequences
11Y60	Evaluation of constants
11Y65	Continued fraction calculations
11Y70	Values of arithmetic functions; tables
11Y99	None of the above, but in this section
11Z05	**Miscellaneous applications of number theory**
12–XX	**FIELD THEORY AND POLYNOMIALS**
12–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
12–01	Instructional exposition (textbooks, tutorial papers, etc.)
12–02	Research exposition (monographs, survey articles)
12–03	Historical (must also be assigned at least one classification number from Section 01)
12–04	Explicit machine computation and programs (not the theory of computation or programming)
12–06	Proceedings, conferences, collections, etc.
12Dxx	**Real and complex fields**
12D05	Polynomials: factorization
12D10	Polynomials: location of zeros (algebraic theorems) {For the analytic theory, see 26C10, 30C15}
12D15	Fields related with sums of squares (formally real fields, Pythagorean fields, etc.) [See also 11Exx]
12D99	None of the above, but in this section
12Exx	**General field theory**
12E05	Polynomials (irreducibility, etc.)
12E10	Special polynomials
12E12	Equations
12E15	Skew fields, division rings [See also 11R52, 11R54, 11S45, 16Kxx]
12E20	Finite fields (field-theoretic aspects)
12E25	Hilbertian fields; Hilbert's irreducibility theorem
12E30	Field arithmetic
12E99	None of the above, but in this section
12Fxx	**Field extensions**
12F05	Algebraic extensions
12F10	Separable extensions, Galois theory
12F12	Inverse Galois theory
12F15	Inseparable extensions
12F20	Transcendental extensions
12F99	None of the above, but in this section
12Gxx	**Homological methods (field theory)**
12G05	Galois cohomology [See also 14F22, 16H05, 16K50]
12G10	Cohomological dimension
12G99	None of the above, but in this section

12Hxx Differential and difference algebra
12H05 Differential algebra [See also 13Nxx]
12H10 Difference algebra [See also 39Axx]
12H20 Abstract differential equations [See also 34Mxx]
12H25 p-adic differential equations [See also 11S80, 14G20]
12H99 None of the above, but in this section
12Jxx Topological fields
12J05 Normed fields
12J10 Valued fields
12J12 Formally p-adic fields
12J15 Ordered fields
12J17 Topological semifields
12J20 General valuation theory [See also 13A18]
12J25 Non-Archimedean valued fields [See also 30G06, 32P05, 46S10, 47S10]
12J27 Krasner-Tate algebras [See mainly 32P05; see also 46S10, 47S10]
12J99 None of the above, but in this section
12Kxx Generalizations of fields
12K05 Near-fields [See also 16Y30]
12K10 Semifields [See also 16Y60]
12K99 None of the above, but in this section
12Lxx Connections with logic
12L05 Decidability [See also 03B25]
12L10 Ultraproducts [See also 03C20]
12L12 Model theory [See also 03C60]
12L15 Nonstandard arithmetic [See also 03H15]
12L99 None of the above, but in this section
12Y05 Computational aspects of field theory and polynomials

13–XX COMMUTATIVE RINGS AND ALGEBRAS
13–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
13–01 Instructional exposition (textbooks, tutorial papers, etc.)
13–02 Research exposition (monographs, survey articles)
13–03 Historical (must also be assigned at least one classification number from Section 01)
13–04 Explicit machine computation and programs (not the theory of computation or programming)
13–06 Proceedings, conferences, collections, etc.
13Axx General commutative ring theory
13A02 Graded rings [See also 16W50]
13A05 Divisibility
13A10 Radical theory
13A15 Ideals; multiplicative ideal theory
13A18 Valuations and their generalizations [See also 12J20]
13A30 Associated graded rings of ideals (Rees ring, form ring), analytic spread and related topics
13A35 Characteristic p methods (Frobenius endomorphism) and reduction to characteristic p; tight closure [See also 13B22]
13A50 Actions of groups on commutative rings; invariant theory [See also 14L24]
13A99 None of the above, but in this section

13Bxx Ring extensions and related topics
13B02 Extension theory
13B05 Galois theory
13B10 Morphisms
13B21 Integral dependence
13B22 Integral closure of rings and ideals [See also 13A35]; integrally closed rings, related rings (Japanese, etc.)
13B24 Going up; going down; going between
13B25 Polynomials over commutative rings [See also 11C08, 13F20, 13M10]
13B30 Quotients and localization
13B35 Completion [See also 13J10]
13B40 Étale and flat extensions; Henselization; Artin approximation [See also 13J15, 14B12, 14B25]
13B99 None of the above, but in this section
13Cxx Theory of modules and ideals
13C05 Structure, classification theorems
13C10 Projective and free modules and ideals [See also 19A13]
13C11 Injective and flat modules and ideals
13C12 Torsion modules and ideals
13C13 Other special types
13C14 Cohen-Macaulay modules [See also 13H10]
13C15 Dimension theory, depth, related rings (catenary, etc.)
13C20 Class groups [See also 11R29]
13C40 Linkage, complete intersections and determinantal ideals [See also 14M06, 14M10, 14M12]
13C99 None of the above, but in this section
13Dxx Homological methods {For noncommutative rings, see 16Exx; for general categories, see 18Gxx}
13D02 Syzygies and resolutions
13D03 (Co)homology of commutative rings and algebras (e.g., Hochschild, André-Quillen, cyclic, dihedral, etc.)
13D05 Homological dimension
13D07 Homological functors on modules (Tor, Ext, etc.)
13D10 Deformations and infinitesimal methods [See also 14B10, 14B12, 14D15, 32Gxx]
13D15 Grothendieck groups, K-theory [See also 14C35, 18F30, 19Axx, 19D50]
13D22 Homological conjectures (intersection theorems)
13D25 Complexes
13D30 Torsion theory [See also 13C12, 18E40]
13D40 Hilbert-Samuel and Hilbert-Kunz functions; Poincaré series
13D45 Local cohomology [See also 14B15]
13D99 None of the above, but in this section
13Exx Chain conditions, finiteness conditions
13E05 Noetherian rings and modules
13E10 Artinian rings and modules, finite-dimensional algebras
13E15 Rings and modules of finite generation or presentation; number of generators
13E99 None of the above, but in this section

13Fxx **Arithmetic rings and other special rings**
13F05 Dedekind, Prüfer and Krull rings and their generalizations
13F07 Euclidean rings and generalizations
13F10 Principal ideal rings
13F15 Factorial rings, unique factorization domains [See also 14M05]
13F20 Polynomial rings and ideals; rings of integer-valued polynomials [See also 11C08, 13B25]
13F25 Formal power series rings [See also 13J05]
13F30 Valuation rings [See also 13A18]
13F40 Excellent rings
13F45 Seminormal rings
13F50 Rings with straightening laws, Hodge algebras
13F55 Face and Stanley-Reisner rings; simplicial complexes [See also 55U10]
13F99 None of the above, but in this section
13G05 **Integral domains**
13Hxx **Local rings and semilocal rings**
13H05 Regular local rings
13H10 Special types (Cohen-Macaulay, Gorenstein, Buchsbaum, etc.) [See also 14M05]
13H15 Multiplicity theory and related topics [See also 14C17]
13H99 None of the above, but in this section
13Jxx **Topological rings and modules [See also 16W60, 16W80]**
13J05 Power series rings [See also 13F25]
13J07 Analytical algebras and rings [See also 32B05]
13J10 Complete rings, completion [See also 13B35]
13J15 Henselian rings [See also 13B40]
13J20 Global topological rings
13J25 Ordered rings [See also 06F25]
13J30 Real algebra [See also 12D15, 14Pxx]
13J99 None of the above, but in this section
13K05 **Witt vectors and related rings**
13L05 **Applications of logic to commutative algebra [See also 03Cxx, 03Hxx]**
13Mxx **Finite commutative rings {For number-theoretic aspects, see 11Txx}**
13M05 Structure
13M10 Polynomials
13M99 None of the above, but in this section
13Nxx **Differential algebra [See also 12H05, 14F10]**
13N05 Modules of differentials
13N10 Rings of differential operators and their modules [See also 16S32, 32C38]
13N15 Derivations
13N99 None of the above, but in this section
13Pxx **Computational aspects of commutative algebra [See also 68W30]**
13P05 Polynomials, factorization [See also 12Y05]
13P10 Polynomial ideals, Gröbner bases [See also 13F20]
13P99 None of the above, but in this section

14–XX **ALGEBRAIC GEOMETRY**
14–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
14–01 Instructional exposition (textbooks, tutorial papers, etc.)
14–02 Research exposition (monographs, survey articles)
14–03 Historical (must also be assigned at least one classification number from Section 01)
14–04 Explicit machine computation and programs (not the theory of computation or programming)
14–06 Proceedings, conferences, collections, etc.
14Axx **Foundations**
14A05 Relevant commutative algebra [See also 13–XX]
14A10 Varieties and morphisms
14A15 Schemes and morphisms
14A20 Generalizations (algebraic spaces, stacks)
14A22 Noncommutative algebraic geometry
14A25 Elementary questions
14A99 None of the above, but in this section
14Bxx **Local theory**
14B05 Singularities [See also 14E15, 14H20, 14J17, 32Sxx, 58Kxx]
14B07 Deformations of singularities [See also 14D15, 32S30]
14B10 Infinitesimal methods [See also 13D10]
14B12 Local deformation theory, Artin approximation, etc. [See also 13B40, 13D10]
14B15 Local cohomology [See also 13D45, 32C36]
14B20 Formal neighborhoods
14B25 Local structure of morphisms: étale, flat, etc. [See also 13B40]
14B99 None of the above, but in this section
14Cxx **Cycles and subschemes**
14C05 Parametrization (Chow and Hilbert schemes)
14C15 Chow groups and rings
14C17 Intersection theory, characteristic classes, intersection multiplicities [See also 13H15]
14C20 Divisors, linear systems, invertible sheaves
14C21 Pencils, nets, webs [See also 53A60]
14C22 Picard groups
14C25 Algebraic cycles
14C30 Transcendental methods, Hodge theory [See also 14D07, 32G20, 32J25, 32S35], Hodge conjecture
14C34 Torelli problem [See also 32G20]
14C35 Applications of methods of algebraic K-theory [See also 19Exx]
14C40 Riemann-Roch theorems [See also 19E20, 19L10]
14C99 None of the above, but in this section
14Dxx **Families, fibrations**
14D05 Structure of families (Picard-Lefschetz, monodromy, etc.)
14D06 Fibrations, degenerations
14D07 Variation of Hodge structures [See also 32G20]
14D10 Arithmetic ground fields (finite, local, global)
14D15 Formal methods; deformations [See also 13D10, 14B07, 32Gxx]

14D20 Algebraic moduli problems, moduli of vector bundles {For analytic moduli problems, see 32G13}

14D21 Applications of vector bundles and moduli spaces in mathematical physics (twistor theory, instantons, quantum field theory)

14D22 Fine and coarse moduli spaces

14D99 None of the above, but in this section

14Exx **Birational geometry**

14E05 Rational and birational maps

14E07 Birational automorphisms, Cremona group and generalizations

14E08 Rationality questions

14E15 Global theory and resolution of singularities [See also 14B05, 32S20, 32S45]

14E20 Coverings [See also 14H30]

14E22 Ramification problems [See also 11S15]

14E25 Embeddings

14E30 Minimal model program (Mori theory, extremal rays)

14E99 None of the above, but in this section

14Fxx **(Co)homology theory [See also 13Dxx]**

14F05 Vector bundles, sheaves, related constructions [See also 14H60, 14J60, 18F20, 32Lxx, 46M20]

14F10 Differentials and other special sheaves [See also 13Nxx, 32C38]

14F17 Vanishing theorems [See also 32L20]

14F20 Étale and other Grothendieck topologies and cohomologies

14F22 Brauer groups of schemes [See also 12G05, 16K50]

14F25 Classical real and complex cohomology

14F30 p-adic cohomology, crystalline cohomology

14F35 Homotopy theory; fundamental groups [See also 14H30]

14F40 de Rham cohomology [See also 14C30, 32C35, 32L10]

14F42 Motivic cohomology

14F43 Other algebro-geometric (co)homologies (e.g., intersection, equivariant, Lawson, Deligne (co)homologies)

14F45 Topological properties

14F99 None of the above, but in this section

14Gxx **Arithmetic problems. Diophantine geometry [See also 11Dxx, 11Gxx]**

14G05 Rational points

14G10 Zeta-functions and related questions [See also 11G40] (Birch-Swinnerton-Dyer conjecture)

14G15 Finite ground fields

14G20 Local ground fields

14G22 Rigid analytic geometry

14G25 Global ground fields

14G27 Other nonalgebraically closed ground fields

14G32 Universal profinite groups (relationship to moduli spaces, projective and moduli towers, Galois theory)

14G35 Modular and Shimura varieties [See also 11F41, 11F46, 11G18]

14G40 Arithmetic varieties and schemes; Arakelov theory; heights [See also 11G50]

14G50 Applications to coding theory and cryptography [See also 94A60, 94B27, 94B40]

14G99 None of the above, but in this section

14Hxx **Curves**

14H05 Algebraic functions; function fields [See also 11R58]

14H10 Families, moduli (algebraic)

14H15 Families, moduli (analytic) [See also 30F10, 32Gxx]

14H20 Singularities, local rings [See also 13Hxx, 14B05]

14H25 Arithmetic ground fields [See also 11Dxx, 11G05, 14Gxx]

14H30 Coverings, fundamental group [See also 14E20, 14F35]

14H37 Automorphisms

14H40 Jacobians, Prym varieties [See also 32G20]

14H42 Theta functions; Schottky problem [See also 14K25, 32G20]

14H45 Special curves and curves of low genus

14H50 Plane and space curves

14H51 Special divisors (gonality, Brill-Noether theory)

14H52 Elliptic curves [See also 11G05, 11G07, 14Kxx]

14H55 Riemann surfaces; Weierstrass points; gap sequences [See also 30Fxx]

14H60 Vector bundles on curves and their moduli [See also 14D20, 14F05]

14H70 Relationships with integrable systems

14H81 Relationships with physics

14H99 None of the above, but in this section

14Jxx **Surfaces and higher-dimensional varieties {For analytic theory, see 32Jxx}**

14J10 Families, moduli, classification: algebraic theory

14J15 Moduli, classification: analytic theory; relations with modular forms [See also 32G13]

14J17 Singularities [See also 14B05, 14E15]

14J20 Arithmetic ground fields [See also 11Dxx, 11G25, 11G35, 14Gxx]

14J25 Special surfaces {For Hilbert modular surfaces, see 14G35}

14J26 Rational and ruled surfaces

14J27 Elliptic surfaces

14J28 $K3$ surfaces and Enriques surfaces

14J29 Surfaces of general type

14J30 3-folds

14J32 Calabi-Yau manifolds, mirror symmetry

14J35 4-folds

14J40 n-folds $(n > 4)$

14J45 Fano varieties

14J50 Automorphisms of surfaces and higher-dimensional varieties

14J60 Vector bundles on surfaces and higher-dimensional varieties, and their moduli [See also 14D20, 14F05, 32Lxx]

14J70   Hypersurfaces
14J80   Topology of surfaces (Donaldson polynomials, Seiberg-Witten invariants)
14J81   Relationships with physics
14J99   None of the above, but in this section
14Kxx   Abelian varieties and schemes
14K02   Isogeny
14K05   Algebraic theory
14K10   Algebraic moduli, classification [See also 11G15]
14K12   Subvarieties
14K15   Arithmetic ground fields [See also 11Dxx, 11Fxx, 11Gxx, 14Gxx]
14K20   Analytic theory; abelian integrals and differentials
14K22   Complex multiplication [See also 11G15]
14K25   Theta functions [See also 14H42]
14K30   Picard schemes, higher Jacobians [See also 14H40, 32G20]
14K99   None of the above, but in this section
14Lxx   Algebraic groups {For linear algebraic groups, see 20Gxx; for Lie algebras, see 17B45}
14L05   Formal groups, p-divisible groups [See also 55N22]
14L10   Group varieties
14L15   Group schemes
14L17   Affine algebraic groups, hyperalgebra constructions [See also 17B45, 18D35]
14L24   Geometric invariant theory [See also 13A50]
14L30   Group actions on varieties or schemes (quotients) [See also 13A50, 14L24]
14L35   Classical groups (geometric aspects) [See also 20Gxx, 51N30]
14L40   Other algebraic groups (geometric aspects)
14L99   None of the above, but in this section
14Mxx   Special varieties
14M05   Varieties defined by ring conditions (factorial, Cohen-Macaulay, seminormal) [See also 13F45, 13H10]
14M06   Linkage [See also 13C40]
14M07   Low codimension problems
14M10   Complete intersections [See also 13C40]
14M12   Determinantal varieties [See also 13C40]
14M15   Grassmannians, Schubert varieties, flag manifolds [See also 32M10, 51M35]
14M17   Homogeneous spaces and generalizations [See also 32M10, 53C30, 57T15]
14M20   Rational and unirational varieties
14M25   Toric varieties, Newton polyhedra [See also 52B20]
14M30   Supervarieties [See also 32C11, 58A50]
14M99   None of the above, but in this section
14Nxx   Projective and enumerative geometry [See also 51–XX]
14N05   Projective techniques [See also 51N35]
14N10   Enumerative problems (combinatorial problems)
14N15   Classical problems, Schubert calculus
14N20   Configurations of linear subspaces
14N25   Varieties of low degree
14N30   Adjunction problems

14N35   Gromov-Witten invariants, quantum cohomology [See also 53D45]
14N99   None of the above, but in this section
14Pxx   Real algebraic and real analytic geometry
14P05   Real algebraic sets [See also 12Dxx]
14P10   Semialgebraic sets and related spaces
14P15   Real analytic and semianalytic sets [See also 32B20, 32C05]
14P20   Nash functions and manifolds [See also 32C07, 58A07]
14P25   Topology of real algebraic varieties
14P99   None of the above, but in this section
14Qxx   Computational aspects in algebraic geometry [See also 12Y05, 13Pxx, 68W30]
14Q05   Curves
14Q10   Surfaces, hypersurfaces
14Q15   Higher-dimensional varieties
14Q20   Effectivity
14Q99   None of the above, but in this section
14Rxx   Affine geometry
14R05   Classification of affine varieties
14R10   Affine spaces (automorphisms, embeddings, exotic structures, cancellation problem)
14R15   Jacobian problem
14R20   Group actions on affine varieties [See also 13A50, 14L30]
14R25   Affine fibrations [See also 14D06]
14R99   None of the above, but in this section
15–XX   LINEAR AND MULTILINEAR ALGEBRA; MATRIX THEORY
15–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
15–01   Instructional exposition (textbooks, tutorial papers, etc.)
15–02   Research exposition (monographs, survey articles)
15–03   Historical (must also be assigned at least one classification number from Section 01)
15–04   Explicit machine computation and programs (not the theory of computation or programming)
15–06   Proceedings, conferences, collections, etc.
15A03   Vector spaces, linear dependence, rank
15A04   Linear transformations, semilinear transformations
15A06   Linear equations
15A09   Matrix inversion, generalized inverses
15A12   Conditioning of matrices [See also 65F35]
15A15   Determinants, permanents, other special matrix functions [See also 19B10, 19B14]
15A18   Eigenvalues, singular values, and eigenvectors
15A21   Canonical forms, reductions, classification
15A22   Matrix pencils [See also 47A56]
15A23   Factorization of matrices
15A24   Matrix equations and identities
15A27   Commutativity
15A29   Inverse problems
15A30   Algebraic systems of matrices [See also 16S50, 20Gxx, 20Hxx]

15A33 Matrices over special rings (quaternions, finite fields, etc.)

15A36 Matrices of integers [See also 11C20]

15A39 Linear inequalities

15A42 Inequalities involving eigenvalues and eigenvectors

15A45 Miscellaneous inequalities involving matrices

15A48 Positive matrices and their generalizations; cones of matrices

15A51 Stochastic matrices

15A52 Random matrices

15A54 Matrices over function rings in one or more variables

15A57 Other types of matrices (Hermitian, skew-Hermitian, etc.)

15A60 Norms of matrices, numerical range, applications of functional analysis to matrix theory [See also 65F35, 65J05]

15A63 Quadratic and bilinear forms, inner products [See mainly 11Exx]

15A66 Clifford algebras, spinors

15A69 Multilinear algebra, tensor products

15A72 Vector and tensor algebra, theory of invariants [See also 13A50, 14L24]

15A75 Exterior algebra, Grassmann algebras

15A78 Other algebras built from modules

15A90 Applications of matrix theory to physics

15A99 Miscellaneous topics

16–XX **ASSOCIATIVE RINGS AND ALGEBRAS** {**For the commutative case, see 13–XX**}

16–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

16–01 Instructional exposition (textbooks, tutorial papers, etc.)

16–02 Research exposition (monographs, survey articles)

16–03 Historical (must also be assigned at least one classification number from Section 01)

16–04 Explicit machine computation and programs (not the theory of computation or programming)

16–06 Proceedings, conferences, collections, etc.

16Bxx **General and miscellaneous**

16B50 Category-theoretic methods and results (except as in 16D90) [See also 18–XX]

16B70 Applications of logic [See also 03Cxx]

16B99 None of the above, but in this section

16Dxx **Modules, bimodules and ideals**

16D10 General module theory

16D20 Bimodules

16D25 Ideals

16D30 Infinite-dimensional simple rings (except as in 16Kxx)

16D40 Free, projective, and flat modules and ideals [See also 19A13]

16D50 Injective modules, self-injective rings [See also 16L60]

16D60 Simple and semisimple modules, primitive rings and ideals

16D70 Structure and classification (except as in 16Gxx), direct sum decomposition, cancellation

16D80 Other classes of modules and ideals [See also 16G50]

16D90 Module categories [See also 16Gxx, 16S90]; module theory in a category-theoretic context; Morita equivalence and duality

16D99 None of the above, but in this section

16Exx **Homological methods** {**For commutative rings, see 13Dxx; for general categories, see 18Gxx**}

16E05 Syzygies, resolutions, complexes

16E10 Homological dimension

16E20 Grothendieck groups, K-theory, etc. [See also 18F30, 19Axx, 19D50]

16E30 Homological functors on modules (Tor, Ext, etc.)

16E40 (Co)homology of rings and algebras (e.g. Hochschild, cyclic, dihedral, etc.)

16E45 Differential graded algebras and applications

16E50 von Neumann regular rings and generalizations

16E60 Semihereditary and hereditary rings, free ideal rings, Sylvester rings, etc.

16E65 Homological conditions on rings (generalizations of regular, Gorenstein, Cohen-Macaulay rings, etc.)

16E99 None of the above, but in this section

16Gxx **Representation theory of rings and algebras**

16G10 Representations of Artinian rings

16G20 Representations of quivers and partially ordered sets

16G30 Representations of orders, lattices, algebras over commutative rings [See also 16H05]

16G50 Cohen-Macaulay modules

16G60 Representation type (finite, tame, wild, etc.)

16G70 Auslander-Reiten sequences (almost split sequences) and Auslander-Reiten quivers

16G99 None of the above, but in this section

16H05 **Orders and arithmetic, separable algebras, Azumaya algebras [See also 11R52, 11R54, 11S45]**

16Kxx **Division rings and semisimple Artin rings [See also 12E15, 15A30]**

16K20 Finite-dimensional {For crossed products, see 16S35}

16K40 Infinite-dimensional and general

16K50 Brauer groups [See also 12G05, 14F22]

16K99 None of the above, but in this section

16Lxx **Local rings and generalizations**

16L30 Noncommutative local and semilocal rings, perfect rings

16L60 Quasi-Frobenius rings [See also 16D50]

16L99 None of the above, but in this section

16Nxx **Radicals and radical properties of rings**

16N20 Jacobson radical, quasimultiplication

16N40 Nil and nilpotent radicals, sets, ideals, rings

16N60 Prime and semiprime rings [See also 16D60, 16U10]

16N80 General radicals and rings {For radicals in module categories, see 16S90}

16N99   None of the above, but in this section

16Pxx   **Chain conditions, growth conditions, and other forms of finiteness**

16P10   Finite rings and finite-dimensional algebras {For semisimple, see 16K20; for commutative, see 11Txx, 13Mxx}

16P20   Artinian rings and modules

16P40   Noetherian rings and modules

16P50   Localization and Noetherian rings [See also 16U20]

16P60   Chain conditions on annihilators and summands: Goldie-type conditions [See also 16U20], Krull dimension

16P70   Chain conditions on other classes of submodules, ideals, subrings, etc.; coherence

16P90   Growth rate, Gel′fand-Kirillov dimension

16P99   None of the above, but in this section

16Rxx   **Rings with polynomial identity**

16R10 T-ideals, identities, varieties of rings and algebras

16R20   Semiprime p.i. rings, rings embeddable in matrices over commutative rings

16R30   Trace rings and invariant theory

16R40   Identities other than those of matrices over commutative rings

16R50   Other kinds of identities (generalized polynomial, rational, involution)

16R99   None of the above, but in this section

16Sxx   **Rings and algebras arising under various constructions**

16S10   Rings determined by universal properties (free algebras, coproducts, adjunction of inverses, etc.)

16S15   Finite generation, finite presentability, normal forms (diamond lemma, term-rewriting)

16S20   Centralizing and normalizing extensions

16S30   Universal enveloping algebras of Lie algebras [See mainly 17B35]

16S32   Rings of differential operators [See also 13N10, 32C38]

16S34   Group rings [See also 20C05, 20C07], Laurent polynomial rings

16S35   Twisted and skew group rings, crossed products

16S36   Ordinary and skew polynomial rings and semigroup rings [See also 20M25]

16S37   Quadratic and Koszul algebras

16S38   Rings arising from non-commutative algebraic geometry

16S40   Smash products of general Hopf actions [See also 16W30]

16S50   Endomorphism rings; matrix rings [See also 15–XX]

16S60   Rings of functions, subdirect products, sheaves of rings

16S70   Extensions of rings by ideals

16S80   Deformations of rings [See also 13D10, 14D15]

16S90   Maximal ring of quotients, torsion theories, radicals on module categories [See also 13D30, 18E40] {For radicals of rings, see 16Nxx}

16S99   None of the above, but in this section

16Uxx   **Conditions on elements**

16U10   Integral domains

16U20   Ore rings, multiplicative sets, Ore localization

16U30   Divisibility, noncommutative UFDs

16U60   Units, groups of units

16U70   Center, normalizer (invariant elements)

16U80   Generalizations of commutativity

16U99   None of the above, but in this section

16Wxx   **Rings and algebras with additional structure**

16W10   Rings with involution; Lie, Jordan and other nonassociative structures [See also 17B60, 17C50, 46Kxx]

16W20   Automorphisms and endomorphisms

16W22   Actions of groups and semigroups; invariant theory

16W25   Derivations, actions of Lie algebras

16W30   Coalgebras, bialgebras, Hopf algebras [See also 16S40, 57T05]; rings, modules, etc. on which these act

16W35   Ring-theoretic aspects of quantum groups [See also 17B37, 20G42, 81R50]

16W50   Graded rings and modules

16W55   "Super" (or "skew") structure [See also 17A70, 17Bxx, 17C70] {For exterior algebras, see 15A75; for Clifford algebras, see 11E88, 15A66}

16W60   Valuations, completions, formal power series and related constructions [See also 13Jxx]

16W70   Filtered rings; filtrational and graded techniques

16W80   Topological and ordered rings and modules [See also 06F25, 13Jxx]

16W99   None of the above, but in this section

16Yxx   **Generalizations** {**For nonassociative rings, see 17–XX**}

16Y30   Near-rings [See also 12K05]

16Y60   Semirings [See also 12K10]

16Y99   None of the above, but in this section

16Z05   **Computational aspects of associative rings [See also 68W30]**

17–XX   **NONASSOCIATIVE RINGS AND ALGEBRAS**

17–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

17–01   Instructional exposition (textbooks, tutorial papers, etc.)

17–02   Research exposition (monographs, survey articles)

17–03   Historical (must also be assigned at least one classification number from Section 01)

17–04   Explicit machine computation and programs (not the theory of computation or programming)

17–06   Proceedings, conferences, collections, etc.

17–08   Computational methods

17Axx   **General nonassociative rings**

17A01   General theory

17A05   Power-associative rings

17A15   Noncommutative Jordan algebras

17A20   Flexible algebras

17A30   Algebras satisfying other identities

17A32 Leibniz algebras
17A35 Division algebras
17A36 Automorphisms, derivations, other operators
17A40 Ternary compositions
17A42 Other n-ary compositions ($n \geq 3$)
17A45 Quadratic algebras (but not quadratic Jordan algebras)
17A50 Free algebras
17A60 Structure theory
17A65 Radical theory
17A70 Superalgebras
17A75 Composition algebras
17A80 Valued algebras
17A99 None of the above, but in this section
17Bxx **Lie algebras and Lie superalgebras** {**For Lie groups, see 22Exx**}
17B01 Identities, free Lie (super)algebras
17B05 Structure theory
17B10 Representations, algebraic theory (weights)
17B15 Representations, analytic theory
17B20 Simple, semisimple, reductive (super)algebras (roots)
17B25 Exceptional (super)algebras
17B30 Solvable, nilpotent (super)algebras
17B35 Universal enveloping (super)algebras [See also 16S30]
17B37 Quantum groups (quantized enveloping algebras) and related deformations [See also 16W35, 20G42, 81R50, 82B23]
17B40 Automorphisms, derivations, other operators
17B45 Lie algebras of linear algebraic groups [See also 14Lxx and 20Gxx]
17B50 Modular Lie (super)algebras
17B55 Homological methods in Lie (super)algebras
17B56 Cohomology of Lie (super)algebras
17B60 Lie (super)algebras associated with other structures (associative, Jordan, etc.) [See also 16W10, 17C40, 17C50]
17B62 Lie bialgebras
17B63 Poisson algebras
17B65 Infinite-dimensional Lie (super)algebras [See also 22E65]
17B66 Lie algebras of vector fields and related (super)algebras
17B67 Kac-Moody (super)algebras (structure and representation theory)
17B68 Virasoro and related algebras
17B69 Vertex operators; vertex operator algebras and related structures
17B70 Graded Lie (super)algebras
17B75 Color Lie (super)algebras
17B80 Applications to integrable systems
17B81 Applications to physics
17B99 None of the above, but in this section
17Cxx **Jordan algebras (algebras, triples and pairs)**
17C05 Identities and free Jordan structures
17C10 Structure theory
17C17 Radicals

17C20 Simple, semisimple algebras
17C27 Idempotents, Peirce decompositions
17C30 Associated groups, automorphisms
17C36 Associated manifolds
17C37 Associated geometries
17C40 Exceptional Jordan structures
17C50 Jordan structures associated with other structures [See also 16W10]
17C55 Finite-dimensional structures
17C60 Division algebras
17C65 Jordan structures on Banach spaces and algebras [See also 46H70, 46L70]
17C70 Super structures
17C90 Applications to physics
17C99 None of the above, but in this section
17Dxx **Other nonassociative rings and algebras**
17D05 Alternative rings
17D10 Mal′cev (Mal′tsev) rings and algebras
17D15 Right alternative rings
17D20 (γ, δ)-rings, including $(1, -1)$-rings
17D25 Lie-admissible algebras
17D92 Genetic algebras
17D99 None of the above, but in this section

18–XX **CATEGORY THEORY; HOMOLOGICAL ALGEBRA** {**For commutative rings see 13Dxx, for associative rings 16Exx, for groups 20Jxx, for topological groups and related structures 57Txx; see also 55Nxx and 55Uxx for algebraic topology**}
18–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
18–01 Instructional exposition (textbooks, tutorial papers, etc.)
18–02 Research exposition (monographs, survey articles)
18–03 Historical (must also be assigned at least one classification number from Section 01)
18–04 Explicit machine computation and programs (not the theory of computation or programming)
18–06 Proceedings, conferences, collections, etc.
18Axx **General theory of categories and functors**
18A05 Definitions, generalizations
18A10 Graphs, diagram schemes, precategories [See especially 20L05]
18A15 Foundations, relations to logic and deductive systems [See also 03–XX]
18A20 Epimorphisms, monomorphisms, special classes of morphisms, null morphisms
18A22 Special properties of functors (faithful, full, etc.)
18A23 Natural morphisms, dinatural morphisms
18A25 Functor categories, comma categories
18A30 Limits and colimits (products, sums, directed limits, pushouts, fiber products, equalizers, kernels, ends and coends, etc.)
18A32 Factorization of morphisms, substructures, quotient structures, congruences, amalgams
18A35 Categories admitting limits (complete categories), functors preserving limits, completions

18A40 Adjoint functors (universal constructions, reflective subcategories, Kan extensions, etc.)

18A99 None of the above, but in this section

18Bxx **Special categories**

18B05 Category of sets, characterizations [See also 03–XX]

18B10 Category of relations, additive relations

18B15 Embedding theorems, universal categories [See also 18E20]

18B20 Categories of machines, automata, operative categories [See also 03D05, 68Qxx]

18B25 Topoi [See also 03G30]

18B30 Categories of topological spaces and continuous mappings [See also 54–XX]

18B35 Preorders, orders and lattices (viewed as categories) [See also 06–XX]

18B40 Groupoids, semigroupoids, semigroups, groups (viewed as categories) [See also 20Axx, 20L05, 20Mxx]

18B99 None of the above, but in this section

18Cxx **Categories and theories**

18C05 Equational categories [See also 03C05, 08C05]

18C10 Theories (e.g. algebraic theories), structure, and semantics [See also 03G30]

18C15 Triples (= standard construction, monad or triad), algebras for a triple, homology and derived functors for triples [See also 18Gxx]

18C20 Algebras and Kleisli categories associated with monads

18C30 Sketches and generalizations

18C35 Accessible and locally presentable categories

18C50 Categorical semantics of formal languages [See also 68Q55, 68Q65]

18C99 None of the above, but in this section

18Dxx **Categories with structure**

18D05 Double categories, 2-categories, bicategories and generalizations

18D10 Monoidal categories (= multiplicative categories), symmetric monoidal categories, braided categories [See also 19D23]

18D15 Closed categories (closed monoidal and Cartesian closed categories, etc.)

18D20 Enriched categories (over closed or monoidal categories)

18D25 Strong functors, strong adjunctions

18D30 Fibered categories

18D35 Structured objects in a category (group objects, etc.)

18D50 Operads [See also 55P48]

18D99 None of the above, but in this section

18Exx **Abelian categories**

18E05 Preadditive, additive categories

18E10 Exact categories, abelian categories

18E15 Grothendieck categories

18E20 Embedding theorems [See also 18B15]

18E25 Derived functors and satellites

18E30 Derived categories, triangulated categories

18E35 Localization of categories

18E40 Torsion theories, radicals [See also 13D30, 16S90]

18E99 None of the above, but in this section

18Fxx **Categories and geometry**

18F05 Local categories and functors

18F10 Grothendieck topologies [See also 14F20]

18F15 Abstract manifolds and fiber bundles [See also 55Rxx, 57Pxx]

18F20 Presheaves and sheaves [See also 14F05, 32C35, 32L10, 54B40, 55N30]

18F25 Algebraic K-theory and L-theory [See also 11Exx, 11R70, 11S70, 12–XX, 13D15, 14Cxx, 16E20, 19–XX, 46L80, 57R65, 57R67]

18F30 Grothendieck groups [See also 13D15, 16E20, 19Axx]

18F99 None of the above, but in this section

18Gxx **Homological algebra [See also 13Dxx, 16Exx, 20Jxx, 55Nxx, 55Uxx, 57Txx]**

18G05 Projectives and injectives [See also 13C10, 13C11, 16D40, 16D50]

18G10 Resolutions; derived functors [See also 13D02, 16E05, 18E25]

18G15 Ext and Tor, generalizations, Künneth formula [See also 55U25]

18G20 Homological dimension [See also 13D05, 16E10]

18G25 Relative homological algebra, projective classes

18G30 Simplicial sets, simplicial objects (in a category) [See also 55U10]

18G35 Chain complexes [See also 18E30, 55U15]

18G40 Spectral sequences, hypercohomology [See also 55Txx]

18G50 Nonabelian homological algebra

18G55 Homotopical algebra

18G60 Other (co)homology theories [See also 19D55, 46L80, 58J20, 58J22]

18G99 None of the above, but in this section

19–XX **K-THEORY [See also 16E20, 18F25]**

19–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

19–01 Instructional exposition (textbooks, tutorial papers, etc.)

19–02 Research exposition (monographs, survey articles)

19–03 Historical (must also be assigned at least one classification number from Section 01)

19–04 Explicit machine computation and programs (not the theory of computation or programming)

19–06 Proceedings, conferences, collections, etc.

19Axx **Grothendieck groups and K_0 [See also 13D15, 18F30]**

19A13 Stability for projective modules [See also 13C10]

19A15 Efficient generation

19A22 Frobenius induction, Burnside and representation rings

19A31 K_0 of group rings and orders

19A49 K_0 of other rings

19A99 None of the above, but in this section

19Bxx **Whitehead groups and K_1**
19B10 Stable range conditions
19B14 Stability for linear groups
19B28 K_1 of group rings and orders [See also 57Q10]
19B37 Congruence subgroup problems [See also 20H05]
19B99 None of the above, but in this section
19Cxx **Steinberg groups and K_2**
19C09 Central extensions and Schur multipliers
19C20 Symbols, presentations and stability of K_2
19C30 K_2 and the Brauer group
19C40 Excision for K_2
19C99 None of the above, but in this section
19Dxx **Higher algebraic K-theory**
19D06 Q- and plus-constructions
19D10 Algebraic K-theory of spaces
19D23 Symmetric monoidal categories [See also 18D10]
19D25 Karoubi-Villamayor-Gersten K-theory
19D35 Negative K-theory, NK and Nil
19D45 Higher symbols, Milnor K-theory
19D50 Computations of higher K-theory of rings [See also 13D15, 16E20]
19D55 K-theory and homology; cyclic homology and cohomology [See also 18G60]
19D99 None of the above, but in this section
19Exx **K-theory in geometry**
19E08 K-theory of schemes [See also 14C35]
19E15 Algebraic cycles and motivic cohomology [See also 14C25, 14C35]
19E20 Relations with cohomology theories [See also 14Fxx]
19E99 None of the above, but in this section
19Fxx **K-theory in number theory [See also 11R70, 11S70]**
19F05 Generalized class field theory [See also 11G45]
19F15 Symbols and arithmetic [See also 11R37]
19F27 Étale cohomology, higher regulators, zeta and L-functions [See also 11G40, 11R42, 11S40, 14F20, 14G10]
19F99 None of the above, but in this section
19Gxx **K-theory of forms [See also 11Exx]**
19G05 Stability for quadratic modules
19G12 Witt groups of rings [See also 11E81]
19G24 L-theory of group rings [See also 11E81]
19G38 Hermitian K-theory, relations with K-theory of rings
19G99 None of the above, but in this section
19Jxx **Obstructions from topology**
19J05 Finiteness and other obstructions in K_0
19J10 Whitehead (and related) torsion
19J25 Surgery obstructions [See also 57R67]
19J35 Obstructions to group actions
19J99 None of the above, but in this section
19Kxx **K-theory and operator algebras [See mainly 46L80, and also 46M20]**
19K14 K_0 as an ordered group, traces
19K33 EXT and K-homology [See also 55N22]
19K35 Kasparov theory (KK-theory) [See also 58J22]
19K56 Index theory [See also 58J20, 58J22]

19K99 None of the above, but in this section
19Lxx **Topological K-theory [See also 55N15, 55R50, 55S25]**
19L10 Riemann-Roch theorems, Chern characters
19L20 J-homomorphism, Adams operations [See also 55Q50]
19L41 Connective K-theory, cobordism [See also 55N22]
19L47 Equivariant K-theory [See also 55N91, 55P91, 55Q91, 55R91, 55S91]
19L64 Computations, geometric applications
19L99 None of the above, but in this section
19M05 **Miscellaneous applications of K-theory**
20–XX **GROUP THEORY AND GENERALIZATIONS**
20–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
20–01 Instructional exposition (textbooks, tutorial papers, etc.)
20–02 Research exposition (monographs, survey articles)
20–03 Historical (must also be assigned at least one classification number from Section 01)
20–04 Explicit machine computation and programs (not the theory of computation or programming)
20–06 Proceedings, conferences, collections, etc.
20Axx **Foundations**
20A05 Axiomatics and elementary properties
20A10 Metamathematical considerations {For word problems, see 20F10}
20A15 Applications of logic to group theory
20A99 None of the above, but in this section
20Bxx **Permutation groups**
20B05 General theory for finite groups
20B07 General theory for infinite groups
20B10 Characterization theorems
20B15 Primitive groups
20B20 Multiply transitive finite groups
20B22 Multiply transitive infinite groups
20B25 Finite automorphism groups of algebraic, geometric, or combinatorial structures [See also 05Bxx, 12F10, 20G40, 20H30, 51–XX]
20B27 Infinite automorphism groups [See also 12F10]
20B30 Symmetric groups
20B35 Subgroups of symmetric groups
20B40 Computational methods
20B99 None of the above, but in this section
20Cxx **Representation theory of groups [See also 19A22 (for representation rings and Burnside rings)]**
20C05 Group rings of finite groups and their modules [See also 16S34]
20C07 Group rings of infinite groups and their modules [See also 16S34]
20C08 Hecke algebras and their representations
20C10 Integral representations of finite groups
20C11 p-adic representations of finite groups
20C12 Integral representations of infinite groups

20C15   Ordinary representations and characters
20C20   Modular representations and characters
20C25   Projective representations and multipliers
20C30   Representations of finite symmetric groups
20C32   Representations of infinite symmetric groups
20C33   Representations of finite groups of Lie type
20C34   Representations of sporadic groups
20C35   Applications of group representations to physics
20C40   Computational methods
20C99   None of the above, but in this section
20Dxx   Abstract finite groups
20D05   Classification of simple and nonsolvable groups
20D06   Simple groups: alternating groups and groups of Lie type [See also 20Gxx]
20D08   Simple groups: sporadic groups
20D10   Solvable groups, theory of formations, Schunck classes, Fitting classes, π-length, ranks [See also 20F17]
20D15   Nilpotent groups, p-groups
20D20   Sylow subgroups, Sylow properties, π-groups, π-structure
20D25   Special subgroups (Frattini, Fitting, etc.)
20D30   Series and lattices of subgroups
20D35   Subnormal subgroups
20D40   Products of subgroups
20D45   Automorphisms
20D60   Arithmetic and combinatorial problems
20D99   None of the above, but in this section
20Exx   Structure and classification of infinite or finite groups
20E05   Free nonabelian groups
20E06   Free products, free products with amalgamation, Higman-Neumann-Neumann extensions, and generalizations
20E07   Subgroup theorems; subgroup growth
20E08   Groups acting on trees [See also 20F65]
20E10   Quasivarieties and varieties of groups
20E15   Chains and lattices of subgroups, subnormal subgroups [See also 20F22]
20E18   Limits, profinite groups
20E22   Extensions, wreath products, and other compositions [See also 20J05]
20E25   Local properties
20E26   Residual properties and generalizations
20E28   Maximal subgroups
20E32   Simple groups [See also 20D05]
20E34   General structure theorems
20E36   General theorems concerning automorphisms of groups
20E42   Groups with a BN-pair; buildings [See also 51E24]
20E45   Conjugacy classes
20E99   None of the above, but in this section
20Fxx   Special aspects of infinite or finite groups
20F05   Generators, relations, and presentations
20F06   Cancellation theory; application of van Kampen diagrams [See also 57M05]

20F10   Word problems, other decision problems, connections with logic and automata [See also 03B25, 03D05, 03D40, 06B25, 08A50, 68Q70]
20F12   Commutator calculus
20F14   Derived series, central series, and generalizations
20F16   Solvable groups, supersolvable groups [See also 20D10]
20F17   Formations of groups, Fitting classes [See also 20D10]
20F18   Nilpotent groups [See also 20D15]
20F19   Generalizations of solvable and nilpotent groups
20F22   Other classes of groups defined by subgroup chains
20F24   FC-groups and their generalizations
20F28   Automorphism groups of groups [See also 20E36]
20F29   Representations of groups as automorphism groups of algebraic systems
20F34   Fundamental groups and their automorphisms [See also 57M05, 57Sxx]
20F36   Braid groups; Artin groups
20F38   Other groups related to topology or analysis
20F40   Associated Lie structures
20F45   Engel conditions
20F50   Periodic groups; locally finite groups
20F55   Reflection and Coxeter groups [See also 22E40, 51F15]
20F60   Ordered groups [See mainly 06F15]
20F65   Geometric group theory [See also 05C25, 20E08, 57Mxx]
20F67   Hyperbolic groups and nonpositively curved groups
20F69   Asymptotic properties of groups
20F99   None of the above, but in this section
20Gxx   Linear algebraic groups (classical groups) {For arithmetic theory, see 11E57, 11H56; for geometric theory, see 14Lxx, 22Exx; for other methods in representation theory, see 15A30, 22E45, 22E46, 22E47, 22E50, 22E55}
20G05   Representation theory
20G10   Cohomology theory
20G15   Linear algebraic groups over arbitrary fields
20G20   Linear algebraic groups over the reals, the complexes, the quaternions
20G25   Linear algebraic groups over local fields and their integers
20G30   Linear algebraic groups over global fields and their integers
20G35   Linear algebraic groups over adèles and other rings and schemes
20G40   Linear algebraic groups over finite fields
20G42   Quantum groups (quantized function algebras) and their representations [See also 16W35, 17B37, 81R50]
20G45   Applications to physics
20G99   None of the above, but in this section

20Hxx **Other groups of matrices [See also 15A30]**
20H05 Unimodular groups, congruence subgroups [See also 11F06, 19B37, 22E40, 51F20]
20H10 Fuchsian groups and their generalizations [See also 11F06, 22E40, 30F35, 32Nxx]
20H15 Other geometric groups, including crystallographic groups [See also 51–XX, especially 51F15, and 82D25]
20H20 Other matrix groups over fields
20H25 Other matrix groups over rings
20H30 Other matrix groups over finite fields
20H99 None of the above, but in this section
20Jxx **Connections with homological algebra and category theory**
20J05 Homological methods in group theory
20J06 Cohomology of groups
20J15 Category of groups
20J99 None of the above, but in this section
20Kxx **Abelian groups**
20K01 Finite abelian groups
20K10 Torsion groups, primary groups and generalized primary groups
20K15 Torsion-free groups, finite rank
20K20 Torsion-free groups, infinite rank
20K21 Mixed groups
20K25 Direct sums, direct products, etc.
20K27 Subgroups
20K30 Automorphisms, homomorphisms, endomorphisms, etc.
20K35 Extensions
20K40 Homological and categorical methods
20K45 Topological methods [See also 22A05, 22B05]
20K99 None of the above, but in this section
20L05 **Groupoids (i.e. small categories in which all morphisms are isomorphisms) {For sets with a single binary operation, see 20N02; for topological groupoids, see 22A22, 58H05}**
20Mxx **Semigroups**
20M05 Free semigroups, generators and relations, word problems
20M07 Varieties of semigroups
20M10 General structure theory
20M11 Radical theory
20M12 Ideal theory
20M14 Commutative semigroups
20M15 Mappings of semigroups
20M17 Regular semigroups
20M18 Inverse semigroups
20M19 Orthodox semigroups
20M20 Semigroups of transformations, etc. [See also 47D03, 47H20, 54H15]
20M25 Semigroup rings, multiplicative semigroups of rings [See also 16S36, 16Y60]
20M30 Representation of semigroups; actions of semigroups on sets
20M35 Semigroups in automata theory, linguistics, etc. [See also 03D05, 68Q70, 68T50]

20M50 Connections of semigroups with homological algebra and category theory
20M99 None of the above, but in this section
20Nxx **Other generalizations of groups**
20N02 Sets with a single binary operation (groupoids)
20N05 Loops, quasigroups [See also 05Bxx]
20N10 Ternary systems (heaps, semiheaps, heapoids, etc.)
20N15 n-ary systems ($n \geq 3$)
20N20 Hypergroups
20N25 Fuzzy groups [See also 03E72]
20N99 None of the above, but in this section
20P05 **Probabilistic methods in group theory [See also 60Bxx]**

22–XX **TOPOLOGICAL GROUPS, LIE GROUPS {For transformation groups, see 54H15, 57Sxx, 58–XX. For abstract harmonic analysis, see 43–XX}**
22–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
22–01 Instructional exposition (textbooks, tutorial papers, etc.)
22–02 Research exposition (monographs, survey articles)
22–03 Historical (must also be assigned at least one classification number from Section 01)
22–04 Explicit machine computation and programs (not the theory of computation or programming)
22–06 Proceedings, conferences, collections, etc.
22Axx **Topological and differentiable algebraic systems {For topological rings and fields, see 12Jxx, 13Jxx, 16W80}**
22A05 Structure of general topological groups
22A10 Analysis on general topological groups
22A15 Structure of topological semigroups
22A20 Analysis on topological semigroups
22A22 Topological groupoids (including differentiable and Lie groupoids) [See also 58H05]
22A25 Representations of general topological groups and semigroups
22A26 Topological semilattices, lattices and applications [See also 06B30, 06B35, 06F30]
22A30 Other topological algebraic systems and their representations
22A99 None of the above, but in this section
22Bxx **Locally compact abelian groups (LCA groups)**
22B05 General properties and structure of LCA groups
22B10 Structure of group algebras of LCA groups
22B99 None of the above, but in this section
22C05 **Compact groups**
22Dxx **Locally compact groups and their algebras**
22D05 General properties and structure of locally compact groups
22D10 Unitary representations of locally compact groups
22D12 Other representations of locally compact groups
22D15 Group algebras of locally compact groups
22D20 Representations of group algebras

22D25 C^*-algebras and W^*-algebras in relation to group representations [See also 46Lxx]

22D30   Induced representations

22D35   Duality theorems

22D40   Ergodic theory on groups [See also 28Dxx]

22D45   Automorphism groups of locally compact groups

22D99   None of the above, but in this section

22Exx   **Lie groups {For the topology of Lie groups and homogeneous spaces, see 57Sxx, 57Txx; for analysis thereon, see 43A80, 43A85, 43A90}**

22E05   Local Lie groups [See also 34–XX, 35–XX, 58H05]

22E10   General properties and structure of complex Lie groups [See also 32M05]

22E15   General properties and structure of real Lie groups

22E20   General properties and structure of other Lie groups

22E25   Nilpotent and solvable Lie groups

22E27   Representations of nilpotent and solvable Lie groups (special orbital integrals, non-type I representations, etc.)

22E30   Analysis on real and complex Lie groups [See also 33C80, 43–XX]

22E35   Analysis on p-adic Lie groups

22E40   Discrete subgroups of Lie groups [See also 20Hxx, 32Nxx]

22E41   Continuous cohomology [See also 57R32, 57Txx, 58H10]

22E43   Structure and representation of the Lorentz group

22E45   Representations of Lie and linear algebraic groups over real fields: analytic methods {For the purely algebraic theory, see 20G05}

22E46   Semisimple Lie groups and their representations

22E47   Representations of Lie and real algebraic groups: algebraic methods (Verma modules, etc.) [See also 17B10]

22E50   Representations of Lie and linear algebraic groups over local fields [See also 20G05]

22E55   Representations of Lie and linear algebraic groups over global fields and adèle rings [See also 20G05]

22E60   Lie algebras of Lie groups {For the algebraic theory of Lie algebras, see 17Bxx}

22E65   Infinite-dimensional Lie groups and their Lie algebras [See also 17B65, 58B25, 58H05]

22E67   Loop groups and related constructions, group-theoretic treatment [See also 58D05]

22E70   Applications of Lie groups to physics; explicit representations [See also 81R05, 81R10]

22E99   None of the above, but in this section

22Fxx   **Noncompact transformation groups**

22F05   General theory of group and pseudogroup actions {For topological properties of spaces with an action, see 57S20}

22F10   Measurable group actions [See also 22D40, 28Dxx, 37Axx]

22F30   Homogeneous spaces {For general actions on manifolds or preserving geometrical structures, see 57M60, 57Sxx; for discrete subgroups of Lie groups see especially 22E40}

22F50   Groups as automorphisms of other structures

26–XX   **REAL FUNCTIONS [See also 54C30]**

26–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

26–01   Instructional exposition (textbooks, tutorial papers, etc.)

26–02   Research exposition (monographs, survey articles)

26–03   Historical (must also be assigned at least one classification number from Section 01)

26–04   Explicit machine computation and programs (not the theory of computation or programming)

26–06   Proceedings, conferences, collections, etc.

26Axx   **Functions of one variable**

26A03   Foundations: limits and generalizations, elementary topology of the line

26A06   One-variable calculus

26A09   Elementary functions

26A12   Rate of growth of functions, orders of infinity, slowly varying functions [See also 26A48]

26A15   Continuity and related questions (modulus of continuity, semicontinuity, discontinuities, etc.) {For properties determined by Fourier coefficients, see 42A16; for those determined by approximation properties, see 41A25, 41A27}

26A16   Lipschitz (Hölder) classes

26A18   Iteration [See also 37Bxx, 37Cxx, 37Exx, 39B12, 47H10, 54H25]

26A21   Classification of real functions; Baire classification of sets and functions [See also 03E15, 28A05, 54C50]

26A24   Differentiation (functions of one variable): general theory, generalized derivatives, mean-value theorems [See also 28A15]

26A27   Nondifferentiability (nondifferentiable functions, points of nondifferentiability), discontinuous derivatives

26A30   Singular functions, Cantor functions, functions with other special properties

26A33   Fractional derivatives and integrals

26A36   Antidifferentiation

26A39   Denjoy and Perron integrals, other special integrals

26A42   Integrals of Riemann, Stieltjes and Lebesgue type [See also 28–XX]

26A45   Functions of bounded variation, generalizations

26A46   Absolutely continuous functions

26A48   Monotonic functions, generalizations

26A51   Convexity, generalizations

26A99   None of the above, but in this section

26Bxx   **Functions of several variables**

26B05   Continuity and differentiation questions

26B10   Implicit function theorems, Jacobians, transformations with several variables

26B12 Calculus of vector functions

26B15 Integration: length, area, volume [See also 28A75, 51M25]

26B20 Integral formulas (Stokes, Gauss, Green, etc.)

26B25 Convexity, generalizations

26B30 Absolutely continuous functions, functions of bounded variation

26B35 Special properties of functions of several variables, Hölder conditions, etc.

26B40 Representation and superposition of functions

26B99 None of the above, but in this section

26Cxx **Polynomials, rational functions**

26C05 Polynomials: analytic properties, etc. [See also 12Dxx, 12Exx]

26C10 Polynomials: location of zeros [See also 12D10, 30C15, 65H05]

26C15 Rational functions [See also 14Pxx]

26C99 None of the above, but in this section

26Dxx **Inequalities {For maximal function inequalities, see 42B25; for functional inequalities, see 39B72; for probabilistic inequalities, see 60E15}**

26D05 Inequalities for trigonometric functions and polynomials

26D07 Inequalities involving other types of functions

26D10 Inequalities involving derivatives and differential and integral operators

26D15 Inequalities for sums, series and integrals

26D20 Other analytical inequalities

26D99 None of the above, but in this section

26Exx **Miscellaneous topics [See also 58Cxx]**

26E05 Real-analytic functions [See also 32B05, 32C05]

26E10 C^∞-functions, quasi-analytic functions [See also 58C25]

26E15 Calculus of functions on infinite-dimensional spaces [See also 46G05, 58Cxx]

26E20 Calculus of functions taking values in infinite-dimensional spaces [See also 46E40, 46G10, 58Cxx]

26E25 Set-valued functions [See also 28B20, 54C60] {For nonsmooth analysis, see 49J52, 58Cxx, 90Cxx}

26E30 Non-Archimedean analysis [See also 12J25]

26E35 Nonstandard analysis [See also 03H05, 28E05, 54J05]

26E40 Constructive real analysis [See also 03F60]

26E50 Fuzzy real analysis [See also 03E72, 28E10]

26E60 Means [See also 47A64]

26E99 None of the above, but in this section

28–XX **MEASURE AND INTEGRATION {For analysis on manifolds, see 58–XX}**

28–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

28–01 Instructional exposition (textbooks, tutorial papers, etc.)

28–02 Research exposition (monographs, survey articles)

28–03 Historical (must also be assigned at least one classification number from Section 01)

28–04 Explicit machine computation and programs (not the theory of computation or programming)

28–06 Proceedings, conferences, collections, etc.

28Axx **Classical measure theory**

28A05 Classes of sets (Borel fields, σ-rings, etc.), measurable sets, Suslin sets, analytic sets [See also 03E15, 26A21, 54H05]

28A10 Real- or complex-valued set functions

28A12 Contents, measures, outer measures, capacities

28A15 Abstract differentiation theory, differentiation of set functions [See also 26A24]

28A20 Measurable and nonmeasurable functions, sequences of measurable functions, modes of convergence

28A25 Integration with respect to measures and other set functions

28A33 Spaces of measures, convergence of measures [See also 46E27, 60Bxx]

28A35 Measures and integrals in product spaces

28A50 Integration and disintegration of measures

28A51 Lifting theory [See also 46G15]

28A60 Measures on Boolean rings, measure algebras [See also 54H10]

28A75 Length, area, volume, other geometric measure theory [See also 26B15, 49Q15]

28A78 Hausdorff and packing measures

28A80 Fractals [See also 37Fxx]

28A99 None of the above, but in this section

28Bxx **Set functions, measures and integrals with values in abstract spaces**

28B05 Vector-valued set functions, measures and integrals [See also 46G10]

28B10 Group- or semigroup-valued set functions, measures and integrals

28B15 Set functions, measures and integrals with values in ordered spaces

28B20 Set-valued set functions and measures; integration of set-valued functions; measurable selections [See also 26E25, 54C60, 54C65, 91B14]

28B99 None of the above, but in this section

28Cxx **Set functions and measures on spaces with additional structure [See also 46G12, 58C35, 58D20]**

28C05 Integration theory via linear functionals (Radon measures, Daniell integrals, etc.), representing set functions and measures

28C10 Set functions and measures on topological groups, Haar measures, invariant measures [See also 22Axx, 43A05]

28C15 Set functions and measures on topological spaces (regularity of measures, etc.)

28C20 Set functions and measures and integrals in infinite-dimensional spaces (Wiener measure, Gaussian measure, etc.) [See also 46G12, 58C35, 58D20, 60B11]

28C99 None of the above, but in this section

28Dxx **Measure-theoretic ergodic theory**
[See also 11K50, 11K55, 22D40, 37Axx, 47A35, 54H20, 60Fxx, 60G10]
28D05 Measure-preserving transformations
28D10 One-parameter continuous families of measure-preserving transformations
28D15 General groups of measure-preserving transformations
28D20 Entropy and other invariants
28D99 None of the above, but in this section
28Exx **Miscellaneous topics in measure theory**
28E05 Nonstandard measure theory [See also 03H05, 26E35]
28E10 Fuzzy measure theory [See also 03E72, 26E50, 94D05]
28E15 Other connections with logic and set theory
28E99 None of the above, but in this section

30–XX **FUNCTIONS OF A COMPLEX VARIABLE**
{**For analysis on manifolds, see 58–XX**}
30–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
30–01 Instructional exposition (textbooks, tutorial papers, etc.)
30–02 Research exposition (monographs, survey articles)
30–03 Historical (must also be assigned at least one classification number from Section 01)
30–04 Explicit machine computation and programs (not the theory of computation or programming)
30–06 Proceedings, conferences, collections, etc.
30Axx **General properties**
30A05 Monogenic properties of complex functions (including polygenic and areolar monogenic functions)
30A10 Inequalities in the complex domain
30A99 None of the above, but in this section
30Bxx **Series expansions**
30B10 Power series (including lacunary series)
30B20 Random power series
30B30 Boundary behavior of power series, over-convergence
30B40 Analytic continuation
30B50 Dirichlet series and other series expansions, exponential series [See also 11M41, 42–XX]
30B60 Completeness problems, closure of a system of functions
30B70 Continued fractions [See also 11A55, 40A15]
30B99 None of the above, but in this section
30Cxx **Geometric function theory**
30C10 Polynomials
30C15 Zeros of polynomials, rational functions, and other analytic functions (e.g. zeros of functions with bounded Dirichlet integral) {For algebraic theory, see 12D10; for real methods, see 26C10}
30C20 Conformal mappings of special domains
30C25 Covering theorems in conformal mapping theory
30C30 Numerical methods in conformal mapping theory [See also 65E05]

30C35 General theory of conformal mappings
30C40 Kernel functions and applications
30C45 Special classes of univalent and multivalent functions (starlike, convex, bounded rotation, etc.)
30C50 Coefficient problems for univalent and multivalent functions
30C55 General theory of univalent and multivalent functions
30C62 Quasiconformal mappings in the plane
30C65 Quasiconformal mappings in $\mathbf{R}^n$, other generalizations
30C70 Extremal problems for conformal and quasiconformal mappings, variational methods
30C75 Extremal problems for conformal and quasiconformal mappings, other methods
30C80 Maximum principle; Schwarz's lemma, Lindelöf principle, analogues and generalizations; subordination
30C85 Capacity and harmonic measure in the complex plane [See also 31A15]
30C99 None of the above, but in this section
30Dxx **Entire and meromorphic functions, and related topics**
30D05 Functional equations in the complex domain, iteration and composition of analytic functions [See also 34Mxx, 37Fxx, 39–XX]
30D10 Representations of entire functions by series and integrals
30D15 Special classes of entire functions and growth estimates
30D20 Entire functions, general theory
30D30 Meromorphic functions, general theory
30D35 Distribution of values, Nevanlinna theory
30D40 Cluster sets, prime ends, boundary behavior
30D45 Bloch functions, normal functions, normal families
30D50 Blaschke products, bounded mean oscillation, bounded characteristic, bounded functions, functions with positive real part
30D55 H^p-classes
30D60 Quasi-analytic and other classes of functions
30D99 None of the above, but in this section
30Exx **Miscellaneous topics of analysis in the complex domain**
30E05 Moment problems, interpolation problems
30E10 Approximation in the complex domain
30E15 Asymptotic representations in the complex domain
30E20 Integration, integrals of Cauchy type, integral representations of analytic functions [See also 45Exx]
30E25 Boundary value problems [See also 45Exx]
30E99 None of the above, but in this section
30Fxx **Riemann surfaces**
30F10 Compact Riemann surfaces and uniformization [See also 14H15, 32G15]
30F15 Harmonic functions on Riemann surfaces
30F20 Classification theory of Riemann surfaces

30F25 Ideal boundary theory
30F30 Differentials on Riemann surfaces
30F35 Fuchsian groups and automorphic functions [See also 11Fxx, 20H10, 22E40, 32Gxx, 32Nxx]
30F40 Kleinian groups [See also 20H10]
30F45 Conformal metrics (hyperbolic, Poincaré, distance functions)
30F50 Klein surfaces
30F60 Teichmüller theory [See also 32G15]
30F99 None of the above, but in this section
30Gxx **Generalized function theory**
30G06 Non-Archimedean function theory [See also 12J25]; nonstandard function theory [See also 03H05]
30G12 Finely holomorphic functions and topological function theory
30G20 Generalizations of Bers or Vekua type (pseudoanalytic, p-analytic, etc.)
30G25 Discrete analytic functions
30G30 Other generalizations of analytic functions (including abstract-valued functions)
30G35 Functions of hypercomplex variables and generalized variables
30G99 None of the above, but in this section
30H05 **Spaces and algebras of analytic functions [See also 32A38, 46Exx, 46J15]**

31–XX **POTENTIAL THEORY {For probabilistic potential theory, see 60J45}**
31–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
31–01 Instructional exposition (textbooks, tutorial papers, etc.)
31–02 Research exposition (monographs, survey articles)
31–03 Historical (must also be assigned at least one classification number from Section 01)
31–04 Explicit machine computation and programs (not the theory of computation or programming)
31–06 Proceedings, conferences, collections, etc.
31Axx **Two-dimensional theory**
31A05 Harmonic, subharmonic, superharmonic functions
31A10 Integral representations, integral operators, integral equations methods
31A15 Potentials and capacity, harmonic measure, extremal length [See also 30C85]
31A20 Boundary behavior (theorems of Fatou type, etc.)
31A25 Boundary value and inverse problems
31A30 Biharmonic, polyharmonic functions and equations, Poisson's equation
31A35 Connections with differential equations
31A99 None of the above, but in this section
31Bxx **Higher-dimensional theory**
31B05 Harmonic, subharmonic, superharmonic functions
31B10 Integral representations, integral operators, integral equations methods
31B15 Potentials and capacities, extremal length
31B20 Boundary value and inverse problems
31B25 Boundary behavior

31B30 Biharmonic and polyharmonic equations and functions
31B35 Connections with differential equations
31B99 None of the above, but in this section
31Cxx **Other generalizations**
31C05 Harmonic, subharmonic, superharmonic functions
31C10 Pluriharmonic and plurisubharmonic functions [See also 32U05]
31C12 Potential theory on Riemannian manifolds [See also 53C20; for Hodge theory, see 58A14]
31C15 Potentials and capacities
31C20 Discrete potential theory and numerical methods
31C25 Dirichlet spaces
31C35 Martin boundary theory [See also 60J50]
31C40 Fine potential theory
31C45 Other generalizations (nonlinear potential theory, etc.)
31C99 None of the above, but in this section
31D05 **Axiomatic potential theory**

32–XX **SEVERAL COMPLEX VARIABLES AND ANALYTIC SPACES {For infinite-dimensional holomorphy, see 46G20, 58B12}**
32–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
32–01 Instructional exposition (textbooks, tutorial papers, etc.)
32–02 Research exposition (monographs, survey articles)
32–03 Historical (must also be assigned at least one classification number from Section 01)
32–04 Explicit machine computation and programs (not the theory of computation or programming)
32–06 Proceedings, conferences, collections, etc.
32Axx **Holomorphic functions of several complex variables**
32A05 Power series, series of functions
32A07 Special domains (Reinhardt, Hartogs, circular, tube)
32A10 Holomorphic functions
32A12 Multifunctions
32A15 Entire functions
32A17 Special families of functions
32A18 Bloch functions, normal functions
32A19 Normal families of functions, mappings
32A20 Meromorphic functions
32A22 Nevanlinna theory (local); growth estimates; other inequalities {For geometric theory, see 32H25, 32H30}
32A25 Integral representations; canonical kernels (Szegő, Bergman, etc.)
32A26 Integral representations, constructed kernels (e.g. Cauchy, Fantappiè-type kernels)
32A27 Local theory of residues [See also 32C30]
32A30 Other generalizations of function theory of one complex variable (should also be assigned at least one classification number from Section 30) {For functions of several hypercomplex variables, see 30G35}

32A35 H^p-spaces, Nevanlinna spaces [See also 32M15, 42B30, 43A85, 46J15]

32A36   Bergman spaces

32A37   Other spaces of holomorphic functions (e.g. bounded mean oscillation (BMOA), vanishing mean oscillation (VMOA)) [See also 46Exx]

32A38   Algebras of holomorphic functions [See also 30H05, 46J10, 46J15]

32A40   Boundary behavior of holomorphic functions

32A45   Hyperfunctions [See also 46F15]

32A50   Harmonic analysis of several complex variables [See mainly 43–XX]

32A55   Singular integrals

32A60   Zero sets of holomorphic functions

32A65   Banach algebra techniques [See mainly 46Jxx]

32A70   Functional analysis techniques [See mainly 46Exx]

32A99   None of the above, but in this section

32Bxx   **Local analytic geometry [See also 13–XX and 14–XX]**

32B05   Analytic algebras and generalizations, preparation theorems

32B10   Germs of analytic sets, local parametrization

32B15   Analytic subsets of affine space

32B20   Semi-analytic sets and subanalytic sets [See also 14P15]

32B25   Triangulation and related questions

32B99   None of the above, but in this section

32Cxx   **Analytic spaces**

32C05   Real-analytic manifolds, real-analytic spaces [See also 14Pxx, 58A07]

32C07   Real-analytic sets, complex Nash functions [See also 14P15, 14P20]

32C09   Embedding of real analytic manifolds

32C11   Complex supergeometry [See also 14A22, 14M30, 58A50]

32C15   Complex spaces

32C18   Topology of analytic spaces

32C20   Normal analytic spaces

32C22   Embedding of analytic spaces

32C25   Analytic subsets and submanifolds

32C30   Integration on analytic sets and spaces, currents {For local theory, see 32A25 or 32A27}

32C35   Analytic sheaves and cohomology groups [See also 14Fxx, 18F20, 55N30]

32C36   Local cohomology of analytic spaces

32C37   Duality theorems

32C38   Sheaves of differential operators and their modules, D-modules [See also 14F10, 16S32, 35A27, 58J15]

32C55   The Levi problem in complex spaces; generalizations

32C81   Applications to physics

32C99   None of the above, but in this section

32Dxx   **Analytic continuation**

32D05   Domains of holomorphy

32D10   Envelopes of holomorphy

32D15   Continuation of analytic objects

32D20   Removable singularities

32D26   Riemann domains

32D99   None of the above, but in this section

32Exx   **Holomorphic convexity**

32E05   Holomorphically convex complex spaces, reduction theory

32E10   Stein spaces, Stein manifolds

32E20   Polynomial convexity

32E30   Holomorphic and polynomial approximation, Runge pairs, interpolation

32E35   Global boundary behavior of holomorphic functions

32E40   The Levi problem

32E99   None of the above, but in this section

32Fxx   **Geometric convexity**

32F10 q-convexity, q-concavity

32F17   Other notions of convexity

32F18   Finite-type conditions

32F27   Topological consequences of geometric convexity

32F32   Analytical consequences of geometric convexity (vanishing theorems, etc.)

32F45   Invariant metrics and pseudodistances

32F99   None of the above, but in this section

32Gxx   **Deformations of analytic structures**

32G05   Deformations of complex structures [See also 13D10, 16S80, 58H10, 58H15]

32G07   Deformations of special (e.g. CR) structures

32G08   Deformations of fiber bundles

32G10   Deformations of submanifolds and subspaces

32G13   Analytic moduli problems {For algebraic moduli problems, see 14D20, 14D22, 14H10, 14J10} [See also 14H15, 14J15]

32G15   Moduli of Riemann surfaces, Teichmüller theory [See also 14H15, 30Fxx]

32G20   Period matrices, variation of Hodge structure; degenerations [See also 14D05, 14D07, 14K30]

32G34   Moduli and deformations for ordinary differential equations (e.g. Khnizhnik-Zamolodchikov equation) [See also 34Mxx]

32G81   Applications to physics

32G99   None of the above, but in this section

32Hxx   **Holomorphic mappings and correspondences**

32H02   Holomorphic mappings, (holomorphic) embeddings and related questions

32H04   Meromorphic mappings

32H12   Boundary uniqueness of mappings

32H25   Picard-type theorems and generalizations {For function-theoretic properties, see 32A22}

32H30   Value distribution theory in higher dimensions {For function-theoretic properties, see 32A22}

32H35   Proper mappings, finiteness theorems

32H40   Boundary regularity of mappings

32H50   Iteration problems

32H99   None of the above, but in this section

32Jxx   **Compact analytic spaces {For Riemann surfaces, see 14Hxx, 30Fxx; for algebraic theory, see 14Jxx}**

32J05   Compactification of analytic spaces

32J10   Algebraic dependence theorems

32J15   Compact surfaces

32J17   Compact 3-folds

32J18   Compact n-folds

32J25   Transcendental methods of algebraic geometry [See also 14C30]

32J27   Compact Kähler manifolds: generalizations, classification

32J81   Applications to physics

32J99   None of the above, but in this section

32Kxx   **Generalizations of analytic spaces (should also be assigned at least one other classification number from Section 32 describing the type of problem)**

32K05   Banach analytic spaces [See also 58Bxx]

32K07   Formal and graded complex spaces [See also 58C50]

32K15   Differentiable functions on analytic spaces, differentiable spaces [See also 58C25]

32K99   None of the above, but in this section

32Lxx   **Holomorphic fiber spaces [See also 55Rxx]**

32L05   Holomorphic bundles and generalizations

32L10   Sheaves and cohomology of sections of holomorphic vector bundles, general results [See also 14F05, 18F20, 55N30]

32L15   Bundle convexity [See also 32F10]

32L20   Vanishing theorems

32L25   Twistor theory, double fibrations [See also 53C28]

32L81   Applications to physics

32L99   None of the above, but in this section

32Mxx   **Complex spaces with a group of automorphisms**

32M05   Complex Lie groups, automorphism groups acting on complex spaces [See also 22E10]

32M10   Homogeneous complex manifolds [See also 14M17, 57T15]

32M12   Almost homogeneous manifolds and spaces [See also 14M17]

32M15   Hermitian symmetric spaces, bounded symmetric domains, Jordan algebras [See also 22E10, 22E40, 53C35, 57T15]

32M17   Automorphism groups of $\mathbf{C}^n$ and affine manifolds

32M25   Complex vector fields

32M99   None of the above, but in this section

32Nxx   **Automorphic functions [See also 11Fxx, 20H10, 22E40, 30F35]**

32N05   General theory of automorphic functions of several complex variables

32N10   Automorphic forms

32N15   Automorphic functions in symmetric domains

32N99   None of the above, but in this section

32P05   **Non-Archimedean complex analysis (should also be assigned at least one other classification number from Section 32 describing the type of problem)**

32Qxx   **Complex manifolds**

32Q05   Negative curvature manifolds

32Q10   Positive curvature manifolds

32Q15   Kähler manifolds

32Q20   Kähler-Einstein manifolds [See also 53Cxx]

32Q25   Calabi-Yau theory

32Q28   Stein manifolds

32Q30   Uniformization

32Q35   Complex manifolds as subdomains of Euclidean space

32Q40   Embedding theorems

32Q45   Hyperbolic and Kobayashi hyperbolic manifolds

32Q55   Topological aspects of complex manifolds

32Q57   Classification theorems

32Q60   Almost complex manifolds

32Q65   Pseudoholomorphic curves

32Q99   None of the above, but in this section

32Sxx   **Singularities [See also 58Kxx]**

32S05   Local singularities [See also 14J17]

32S10   Invariants of analytic local rings

32S15   Equisingularity (topological and analytic) [See also 14E15]

32S20   Global theory of singularities; cohomological properties [See also 14E15]

32S22   Relations with arrangements of hyperplanes [See also 52C35]

32S25   Surface and hypersurface singularities [See also 14J17]

32S30   Deformations of singularities; vanishing cycles [See also 14B07]

32S35   Mixed Hodge theory of singular varieties [See also 14C30, 14D07]

32S40   Monodromy; relations with differential equations and D-modules

32S45   Modifications; resolution of singularities [See also 14E15]

32S50   Topological aspects: Lefschetz theorems, topological classification, invariants

32S55   Milnor fibration; relations with knot theory [See also 57M25, 57Q45]

32S60   Stratifications; constructible sheaves; intersection cohomology [See also 58Kxx]

32S65   Singularities of holomorphic vector fields and foliations

32S70   Other operations on singularities

32S99   None of the above, but in this section

32Txx   **Pseudoconvex domains**

32T05   Domains of holomorphy

32T15   Strongly pseudoconvex domains

32T20   Worm domains

32T25   Finite type domains

32T27   Geometric and analytic invariants on weakly pseudoconvex boundaries

32T35   Exhaustion functions

32T40   Peak functions

32T99   None of the above, but in this section

32Uxx   **Pluripotential theory**
32U05   Plurisubharmonic functions and generalizations [See also 31C10]
32U10   Plurisubharmonic exhaustion functions
32U15   General pluripotential theory
32U20   Capacity theory and generalizations
32U25   Lelong numbers
32U30   Removable sets
32U35   Pluricomplex Green functions
32U40   Currents
32U99   None of the above, but in this section
32Vxx   **CR Manifolds**
32V05   CR structures, CR operators, and generalizations
32V10   CR functions
32V15   CR manifolds as boundaries of domains
32V20   Analysis on CR manifolds
32V25   Extension of functions and other analytic objects from CR manifolds
32V30   Embeddings of CR manifolds
32V35   Finite type conditions on CR manifolds
32V40   Real submanifolds in complex manifolds
32V99   None of the above, but in this section
32Wxx   **Differential operators in several variables**
32W05 $\overline{\partial}$ and $\overline{\partial}$-Neumann operators
32W10 $\overline{\partial}_b$ and $\overline{\partial}_b$-Neumann operators
32W20   Complex Monge-Ampère operators
32W25   Pseudodifferential operators in several complex variables
32W30   Heat kernels in several complex variables
32W50   Other partial differential equations of complex analysis
32W99   None of the above, but in this section
33–XX   **SPECIAL FUNCTIONS (33–XX DEALS WITH THE PROPERTIES OF FUNCTIONS AS FUNCTIONS) {For orthogonal functions, see 42Cxx; for aspects of combinatorics see 05Axx; for number-theoretic aspects see 11–XX; for representation theory see 22Exx}**
33–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
33–01   Instructional exposition (textbooks, tutorial papers, etc.)
33–02   Research exposition (monographs, survey articles)
33–03   Historical (must also be assigned at least one classification number from Section 01)
33–04   Explicit machine computation and programs (not the theory of computation or programming)
33–06   Proceedings, conferences, collections, etc.
33Bxx   **Elementary classical functions**
33B10   Exponential and trigonometric functions
33B15   Gamma, beta and polygamma functions
33B20   Incomplete beta and gamma functions (error functions, probability integral, Fresnel integrals)
33B30   Higher logarithm functions
33B99   None of the above, but in this section
33Cxx   **Hypergeometric functions**
33C05   Classical hypergeometric functions, $_2F_1$

33C10   Bessel and Airy functions, cylinder functions, $_0F_1$
33C15   Confluent hypergeometric functions, Whittaker functions, $_1F_1$
33C20   Generalized hypergeometric series, $_pF_q$
33C45   Orthogonal polynomials and functions of hypergeometric type (Jacobi, Laguerre, Hermite, Askey scheme, etc.) [See also 42C05 for general orthogonal polynomials and functions]
33C47   Other special orthogonal polynomials and functions
33C50   Orthogonal polynomials and functions in several variables expressible in terms of special functions in one variable
33C52   Orthogonal polynomials and functions associated with root systems
33C55   Spherical harmonics
33C60   Hypergeometric integrals and functions defined by them (E, G and H functions)
33C65   Appell, Horn and Lauricella functions
33C67   Hypergeometric functions associated with root systems
33C70   Other hypergeometric functions and integrals in several variables
33C75   Elliptic integrals as hypergeometric functions
33C80   Connections with groups and algebras, and related topics
33C90   Applications
33C99   None of the above, but in this section
33Dxx   **Basic hypergeometric functions**
33D05 q-gamma functions, q-beta functions and integrals
33D15   Basic hypergeometric functions in one variable, $_r\varphi_s$
33D45   Basic orthogonal polynomials and functions (Askey-Wilson polynomials, etc.)
33D50   Orthogonal polynomials and functions in several variables expressible in terms of basic hypergeometric functions in one variable
33D52   Basic orthogonal polynomials and functions associated with root systems (Macdonald polynomials, etc.)
33D60   Basic hypergeometric integrals and functions defined by them
33D65   Bibasic functions and multiple bases
33D67   Basic hypergeometric functions associated with root systems
33D70   Other basic hypergeometric functions and integrals in several variables
33D80   Connections with quantum groups, Chevalley groups, p-adic groups, Hecke algebras, and related topics
33D90   Applications
33D99   None of the above, but in this section
33Exx   **Other special functions**
33E05   Elliptic functions and integrals
33E10   Lamé, Mathieu, and spheroidal wave functions
33E12   Mittag-Leffler functions and generalizations
33E15   Other wave functions
33E17   Painlevé-type functions

33E20	Other functions defined by series and integrals
33E30	Other functions coming from differential, difference and integral equations
33E50	Special functions in characteristic p (gamma functions, etc.)
33E99	None of the above, but in this section
33Fxx	**Computational aspects**
33F05	Numerical approximation [See also 65D20]
33F10	Symbolic computation (Gosper and Zeilberger algorithms, etc.) [See also 68W30]
33F99	None of the above, but in this section
34–XX	**ORDINARY DIFFERENTIAL EQUATIONS**
34–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
34–01	Instructional exposition (textbooks, tutorial papers, etc.)
34–02	Research exposition (monographs, survey articles)
34–03	Historical (must also be assigned at least one classification number from Section 01)
34–04	Explicit machine computation and programs (not the theory of computation or programming)
34–06	Proceedings, conferences, collections, etc.
34Axx	**General theory**
34A05	Explicit solutions and reductions
34A09	Implicit equations, differential-algebraic equations [See also 65L80]
34A12	Initial value problems, existence, uniqueness, continuous dependence and continuation of solutions
34A25	Analytical theory: series, transformations, transforms, operational calculus, etc. [See also 44–XX]
34A26	Geometric methods in differential equations
34A30	Linear equations and systems, general
34A34	Nonlinear equations and systems, general
34A35	Differential equations of infinite order
34A36	Discontinuous equations
34A37	Differential equations with impulses
34A40	Differential inequalities [See also 26D20]
34A45	Theoretical approximation of solutions {For numerical analysis, see 65Lxx}
34A55	Inverse problems
34A60	Differential inclusions [See also 49J24, 49K24]
34A99	None of the above, but in this section
34Bxx	**Boundary value problems** {**For ordinary differential operators, see 34Lxx**}
34B05	Linear boundary value problems
34B07	Linear boundary value problems with nonlinear dependence on the spectral parameter
34B08	Multi-parameter boundary value problems
34B09	Boundary value problems with an indefinite weight
34B10	Multipoint boundary value problems
34B15	Nonlinear boundary value problems
34B16	Singular nonlinear boundary value problems
34B18	Positive solutions of nonlinear boundary value problems

34B20	Weyl theory and its generalizations
34B24	Sturm-Liouville theory [See also 34Lxx]
34B27	Green functions
34B30	Special equations (Mathieu, Hill, Bessel, etc.)
34B37	Boundary value problems with impulses
34B40	Boundary value problems on infinite intervals
34B45	Boundary value problems on graphs and networks
34B60	Applications
34B99	None of the above, but in this section
34Cxx	**Qualitative theory** [See also 37–XX]
34C05	Location of integral curves, singular points, limit cycles
34C07	Theory of limit cycles of polynomial and analytic vector fields (existence, uniqueness, bounds, Hilbert's 16th problem and ramifications)
34C08	Connections with real algebraic geometry (fewnomials, desingularization, zeros of Abelian integrals, etc.)
34C10	Oscillation theory, zeros, disconjugacy and comparison theory
34C11	Growth, boundedness, comparison of solutions
34C12	Monotone systems
34C14	Symmetries, invariants
34C15	Nonlinear oscillations, coupled oscillators
34C20	Transformation and reduction of equations and systems, normal forms
34C23	Bifurcation [See mainly 37Gxx]
34C25	Periodic solutions
34C26	Relaxation oscillations
34C27	Almost periodic solutions
34C28	Complex behavior, chaotic systems [See mainly 37Dxx]
34C29	Averaging method
34C30	Manifolds of solutions
34C37	Homoclinic and heteroclinic solutions
34C40	Equations and systems on manifolds
34C41	Equivalence, asymptotic equivalence
34C45	Method of integral manifolds
34C55	Hysteresis
34C60	Applications
34C99	None of the above, but in this section
34Dxx	**Stability theory** [See also 37C75, 93Dxx]
34D05	Asymptotic properties
34D08	Characteristic and Lyapunov exponents
34D09	Dichotomy, trichotomy
34D10	Perturbations
34D15	Singular perturbations
34D20	Lyapunov stability
34D23	Global stability
34D30	Structural stability and analogous concepts [See also 37C20]
34D35	Stability of manifolds of solutions
34D40	Ultimate boundedness
34D45	Attractors [See also 37C70, 37D45]
34D99	None of the above, but in this section
34Exx	**Asymptotic theory**
34E05	Asymptotic expansions
34E10	Perturbations, asymptotics

34E13	Multiple scale methods
34E15	Singular perturbations, general theory
34E18	Methods of nonstandard analysis
34E20	Singular perturbations, turning point theory, WKB methods
34E99	None of the above, but in this section
34F05	**Equations and systems with randomness [See also 34K50, 60H10, 93E03]**
34Gxx	**Differential equations in abstract spaces [See also 34Lxx, 37Kxx, 47Dxx, 47Hxx, 47Jxx, 58D25]**
34G10	Linear equations [See also 47D06, 47D09]
34G20	Nonlinear equations [See also 47Hxx, 47Jxx]
34G25	Evolution inclusions
34G99	None of the above, but in this section
34H05	**Control problems [See also 49J25, 49K25, 93C15]**
34Kxx	**Functional-differential and differential-difference equations, with or without deviating arguments [See also 37–XX]**
34K05	General theory
34K06	Linear functional-differential equations
34K07	Theoretical approximation of solutions
34K10	Boundary value problems
34K11	Oscillation theory
34K12	Growth, boundedness, comparison of solutions
34K13	Periodic solutions
34K14	Almost periodic solutions
34K17	Transformation and reduction of equations and systems, normal forms
34K18	Bifurcation theory
34K19	Invariant manifolds
34K20	Stability theory
34K23	Complex (chaotic) behavior of solutions
34K25	Asymptotic theory
34K26	Singular perturbations
34K28	Numerical approximation of solutions
34K29	Inverse problems
34K30	Equations in abstract spaces [See also 34Gxx, 47Dxx, 47Jxx]
34K35	Control problems [See also 49J25, 49K25, 93C15]
34K40	Neutral equations
34K45	Equations with impulses
34K50	Stochastic delay equations [See also 34F05, 60Hxx]
34K60	Applications
34K99	None of the above, but in this section
34Lxx	**Ordinary differential operators [See also 47E05]**
34L05	General spectral theory
34L10	Eigenfunction expansions, completeness of eigenfunctions
34L15	Estimation of eigenvalues, upper and lower bounds
34L16	Numerical approximation of eigenvalues and of other parts of the spectrum

34L20	Asymptotic distribution of eigenvalues, asymptotic theory of eigenfunctions
34L25	Scattering theory
34L30	Nonlinear ordinary differential operators
34L40	Particular operators (Dirac, one-dimensional Schrödinger, etc.)
34L99	None of the above, but in this section
34Mxx	**Differential equations in the complex domain [See also 30Dxx, 32G34]**
34M05	Entire and meromorphic solutions
34M10	Oscillation, growth of solutions
34M15	Algebraic aspects (differential-algebraic, hypertranscendence, group-theoretical)
34M20	Nonanalytic aspects
34M25	Formal solutions, transform techniques
34M30	Asymptotics, summation methods
34M35	Singularities, monodromy, local behavior of solutions, normal forms
34M37	Resurgence phenomena
34M40	Stokes phenomena and connection problems (linear and nonlinear)
34M45	Differential equations on complex manifolds
34M50	Inverse problems (Riemann-Hilbert, inverse differential Galois, etc.)
34M55	Painlevé and other special equations; classification, hierarchies; isomonodromic deformations
34M60	Singular perturbation problems in the complex domain (complex WKB, turning points, steepest descent) [See also 34E20]
34M99	None of the above, but in this section
35–XX	**PARTIAL DIFFERENTIAL EQUATIONS**
35–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
35–01	Instructional exposition (textbooks, tutorial papers, etc.)
35–02	Research exposition (monographs, survey articles)
35–03	Historical (must also be assigned at least one classification number from Section 01)
35–04	Explicit machine computation and programs (not the theory of computation or programming)
35–06	Proceedings, conferences, collections, etc.
35Axx	**General theory**
35A05	General existence and uniqueness theorems
35A07	Local existence and uniqueness theorems [See also 35Hxx, 35Sxx]
35A08	Fundamental solutions
35A10	Cauchy-Kovalevskaya theorems
35A15	Variational methods
35A17	Parametrices
35A18	Wave front sets
35A20	Analytic methods, singularities
35A21	Propagation of singularities
35A22	Transform methods (e.g. integral transforms)
35A25	Other special methods

35A27 Microlocal methods; methods of sheaf theory and homological algebra in PDE [See also 32C38, 58J15]

35A30 Geometric theory, characteristics, transformations [See also 58J70, 58J72]

35A35 Theoretical approximation to solutions {For numerical analysis, see 65Mxx, 65Nxx}

35A99 None of the above, but in this section

35Bxx Qualitative properties of solutions

35B05 General behavior of solutions of PDE (comparison theorems; oscillation, zeros and growth of solutions; mean value theorems)

35B10 Periodic solutions

35B15 Almost periodic solutions

35B20 Perturbations

35B25 Singular perturbations

35B27 Homogenization; partial differential equations in media with periodic structure [See also 74Qxx, 76M50]

35B30 Dependence of solutions of PDE on initial and boundary data, parameters [See also 37Cxx]

35B32 Bifurcation [See also 37Gxx, 37K50]

35B33 Critical exponents

35B34 Resonances

35B35 Stability, boundedness

35B37 PDE in connection with control problems [See also 49J20, 49K20, 93C20]

35B38 Critical points

35B40 Asymptotic behavior of solutions

35B41 Attractors

35B42 Inertial manifolds

35B45 A priori estimates

35B50 Maximum principles

35B60 Continuation and prolongation of solutions of PDE [See also 58A15, 58A17, 58Hxx]

35B65 Smoothness and regularity of solutions of PDE

35B99 None of the above, but in this section

35Cxx Representations of solutions

35C05 Solutions in closed form

35C10 Series solutions, expansion theorems

35C15 Integral representations of solutions of PDE

35C20 Asymptotic expansions

35C99 None of the above, but in this section

35Dxx Generalized solutions of partial differential equations

35D05 Existence of generalized solutions

35D10 Regularity of generalized solutions

35D99 None of the above, but in this section

35Exx Equations and systems with constant coefficients [See also 35N05]

35E05 Fundamental solutions

35E10 Convexity properties

35E15 Initial value problems

35E20 General theory

35E99 None of the above, but in this section

35Fxx General first-order equations and systems

35F05 General theory of linear first-order PDE

35F10 Initial value problems for linear first-order PDE, linear evolution equations

35F15 Boundary value problems for linear first-order PDE

35F20 General theory of nonlinear first-order PDE

35F25 Initial value problems for nonlinear first-order PDE, nonlinear evolution equations

35F30 Boundary value problems for nonlinear first-order PDE

35F99 None of the above, but in this section

35Gxx General higher-order equations and systems

35G05 General theory of linear higher-order PDE

35G10 Initial value problems for linear higher-order PDE, linear evolution equations

35G15 Boundary value problems for linear higher-order PDE

35G20 General theory of nonlinear higher-order PDE

35G25 Initial value problems for nonlinear higher-order PDE, nonlinear evolution equations

35G30 Boundary value problems for nonlinear higher-order PDE

35G99 None of the above, but in this section

35Hxx Close-to-elliptic equations

35H10 Hypoelliptic equations

35H20 Subelliptic equations

35H30 Quasi-elliptic equations

35H99 None of the above, but in this section

35Jxx Partial differential equations of elliptic type [See also 58J10, 58J20]

35J05 Laplace equation, reduced wave equation (Helmholtz), Poisson equation [See also 31Axx, 31Bxx]

35J10 Schrödinger operator [See also 35Pxx]

35J15 General theory of second-order, elliptic equations

35J20 Variational methods for second-order, elliptic equations

35J25 Boundary value problems for second-order, elliptic equations

35J30 General theory of higher-order, elliptic equations [See also 31A30, 31B30]

35J35 Variational methods for higher-order, elliptic equations

35J40 Boundary value problems for higher-order, elliptic equations

35J45 General theory of elliptic systems of PDE

35J50 Variational methods for elliptic systems

35J55 Boundary value problems for elliptic systems

35J60 Nonlinear PDE of elliptic type

35J65 Nonlinear boundary value problems for linear elliptic PDE; boundary value problems for nonlinear elliptic PDE

35J67 Boundary values of solutions to elliptic PDE

35J70 Elliptic partial differential equations of degenerate type

35J85 Unilateral problems and variational inequalities for elliptic PDE [See also 35R35, 49J40]

35J99 None of the above, but in this section

35Kxx **Parabolic equations and systems**
[See also 35Bxx, 35Dxx, 35R30, 35R35, 58J35]
35K05 Heat equation
35K10 General theory of second-order, parabolic equations
35K15 Initial value problems for second-order, parabolic equations
35K20 Boundary value problems for second-order, parabolic equations
35K25 General theory of higher-order, parabolic equations
35K30 Initial value problems for higher-order, parabolic equations
35K35 Boundary value problems for higher-order, parabolic equations
35K40 General theory of parabolic systems of PDE
35K45 Initial value problems for parabolic systems
35K50 Boundary value problems for parabolic systems
35K55 Nonlinear PDE of parabolic type
35K57 Reaction-diffusion equations
35K60 Nonlinear boundary value problems for linear parabolic PDE; boundary value problems for nonlinear parabolic PDE
35K65 Parabolic partial differential equations of degenerate type
35K70 Ultraparabolic, pseudoparabolic PDE, etc.
35K85 Unilateral problems and variational inequalities for parabolic PDE [See also 35R35, 49J40]
35K90 Abstract parabolic evolution equations
35K99 None of the above, but in this section
35Lxx **Partial differential equations of hyperbolic type [See also 58J45]**
35L05 Wave equation
35L10 General theory of second-order, hyperbolic equations
35L15 Initial value problems for second-order, hyperbolic equations
35L20 Boundary value problems for second-order, hyperbolic equations
35L25 General theory of higher-order, hyperbolic equations
35L30 Initial value problems for higher-order, hyperbolic equations
35L35 Boundary value problems for higher-order, hyperbolic equations
35L40 General theory of hyperbolic systems of first-order PDE
35L45 Initial value problems for hyperbolic systems of first-order PDE
35L50 Boundary value problems for hyperbolic systems of first-order PDE
35L55 Hyperbolic systems of higher-order PDE
35L60 Nonlinear first-order PDE of hyperbolic type
35L65 Conservation laws
35L67 Shocks and singularities [See also 58Kxx, 76L05]
35L70 Nonlinear second-order PDE of hyperbolic type
35L75 Nonlinear hyperbolic PDE of higher (> 2) order
35L80 Hyperbolic PDE of degenerate type

35L82 Pseudohyperbolic equations
35L85 Unilateral problems; variational inequalities for hyperbolic PDE [See also 35R35, 49J40]
35L90 Abstract hyperbolic evolution equations
35L99 None of the above, but in this section
35Mxx **Partial differential equations of special type (mixed, composite, etc.) {For degenerate types, see 35J70, 35K65, 35L80}**
35M10 PDE of mixed type
35M20 PDE of composite type
35M99 None of the above, but in this section
35Nxx **Overdetermined systems [See also 58Hxx, 58J10, 58J15]**
35N05 Overdetermined systems with constant coefficients
35N10 Overdetermined systems with variable coefficients (general)
35N15 $\bar{\partial}$-Neumann problem and generalizations; formal complexes [See also 32W05, 32W10, 58J10]
35N99 None of the above, but in this section
35Pxx **Spectral theory and eigenvalue problems for partial differential operators [See also 47Axx, 47Bxx, 47F05]**
35P05 General spectral theory of PDE
35P10 Completeness of eigenfunctions, eigenfunction expansions for PDO
35P15 Estimation of eigenvalues, upper and lower bounds
35P20 Asymptotic distribution of eigenvalues and eigenfunctions for PDO
35P25 Scattering theory for PDE [See also 47A40]
35P30 Nonlinear eigenvalue problems, nonlinear spectral theory for PDO
35P99 None of the above, but in this section
35Qxx **Equations of mathematical physics and other areas of application [See also 35J05, 35J10, 35K05, 35L05]**
35Q05 Euler-Poisson-Darboux equation and generalizations
35Q15 Riemann-Hilbert problems [See also 30E25, 31A25, 31B20]
35Q30 Stokes and Navier-Stokes equations [See also 76D05, 76D07, 76N10]
35Q35 Other equations arising in fluid mechanics
35Q40 Equations from quantum mechanics
35Q51 Solitons [See also 37K40]
35Q53 KdV-like equations (Korteweg-de Vries, Burgers, sine-Gordon, sinh-Gordon, etc.) [See also 37K10]
35Q55 NLS-like (nonlinear Schrödinger) equations [See also 37K10]
35Q58 Other completely integrable equations [See also 37J35, 37K10]
35Q60 Equations of electromagnetic theory and optics
35Q72 Other equations from mechanics
35Q75 PDE in relativity
35Q80 Applications of PDE in areas other than physics
35Q99 None of the above, but in this section

35Rxx **Miscellaneous topics involving partial differential equations** {**For equations on manifolds, see 58Jxx; for manifolds of solutions, see 58Bxx; for stochastic PDEs, see also 60H15**}

35R05 PDE with discontinuous coefficients or data

35R10 Partial functional-differential or differential-difference equations, with or without deviating arguments

35R12 Impulsive partial differential equations

35R15 Partial differential equations on infinite-dimensional (e.g. function) spaces (= PDE in infinitely many variables) [See also 46Gxx, 58D25]

35R20 Partial operator-differential equations (i.e. PDE on finite-dimensional spaces for abstract space valued functions) [See also 34Gxx, 47A50, 47D03, 47D06, 47D09, 47H20, 47Jxx]

35R25 Improperly posed problems for PDE

35R30 Inverse problems (undetermined coefficients, etc.) for PDE

35R35 Free boundary problems for PDE

35R45 Partial differential inequalities

35R50 Partial differential equations of infinite order

35R60 Partial differential equations with randomness [See also 60H15]

35R70 PDE with multivalued right-hand sides

35R99 None of the above, but in this section

35Sxx **Pseudodifferential operators and other generalizations of partial differential operators [See also 47G30, 58J40]**

35S05 General theory of PsDO

35S10 Initial value problems for PsDO

35S15 Boundary value problems for PsDO

35S30 Fourier integral operators

35S35 Topological aspects: intersection cohomology, stratified sets, etc. [See also 32C38, 32S40, 32S60, 58J15]

35S50 Paradifferential operators

35S99 None of the above, but in this section

37–XX **DYNAMICAL SYSTEMS AND ERGODIC THEORY [See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70–XX]**

37–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

37–01 Instructional exposition (textbooks, tutorial papers, etc.)

37–02 Research exposition (monographs, survey articles)

37–03 Historical (must also be assigned at least one classification number from Section 01)

37–04 Explicit machine computation and programs (not the theory of computation or programming)

37–06 Proceedings, conferences, collections, etc.

37Axx **Ergodic theory [See also 28Dxx]**

37A05 Measure-preserving transformations

37A10 One-parameter continuous families of measure-preserving transformations

37A15 General groups of measure-preserving transformations [See mainly 22Fxx]

37A17 Homogeneous flows [See also 22Fxx]

37A20 Orbit equivalence, cocycles, ergodic equivalence relations

37A25 Ergodicity, mixing, rates of mixing

37A30 Ergodic theorems, spectral theory, Markov operators {For operator ergodic theory, see mainly 47A35}

37A35 Entropy and other invariants, isomorphism, classification

37A40 Nonsingular (and infinite-measure preserving) transformations

37A45 Relations with number theory and harmonic analysis [See also 11Kxx]

37A50 Relations with probability theory and stochastic processes [See also 60Fxx and 60G10]

37A55 Relations with the theory of C^*-algebras [See mainly 46L55]

37A60 Dynamical systems in statistical mechanics [See also 82Cxx]

37A99 None of the above, but in this section

37Bxx **Topological dynamics [See also 54H20]**

37B05 Transformations and group actions with special properties (minimality, distality, proximality, etc.)

37B10 Symbolic dynamics [See also 37Cxx, 37Dxx]

37B15 Cellular automata

37B20 Notions of recurrence

37B25 Lyapunov functions and stability; attractors, repellers

37B30 Index theory, Morse-Conley indices

37B35 Gradient-like and recurrent behavior; isolated (locally-maximal) invariant sets

37B40 Topological entropy

37B45 Continua theory in dynamics

37B50 Multi-dimensional shifts of finite type, tiling dynamics

37B55 Nonautonomous dynamical systems

37B99 None of the above, but in this section

37Cxx **Smooth dynamical systems: general theory [See also 34Cxx, 34Dxx]**

37C05 Smooth mappings and diffeomorphisms

37C10 Vector fields, flows, ordinary differential equations

37C15 Topological and differentiable equivalence, conjugacy, invariants, moduli, classification

37C20 Generic properties, structural stability

37C25 Fixed points, periodic points, fixed-point index theory

37C27 Periodic orbits of vector fields and flows

37C29 Homoclinic and heteroclinic orbits

37C30 Zeta functions, (Ruelle-Frobenius) transfer operators, and other functional analytic techniques in dynamical systems

37C35 Orbit growth

37C40 Smooth ergodic theory, invariant measures [See also 37Dxx]

37C45 Dimension theory of dynamical systems

37C50 Approximate trajectories (pseudotrajectories, shadowing, etc.)

37C55 Periodic and quasiperiodic flows and diffeomorphisms

37C60 Nonautonomous smooth dynamical systems [See also 37B55]

37C65 Monotone flows

37C70 Attractors and repellers, topological structure

37C75 Stability theory

37C80 Symmetries, equivariant dynamical systems

37C85 Dynamics of group actions other than **Z** and **R**, and foliations [See mainly 22Fxx, and also 57R30, 57Sxx]

37C99 None of the above, but in this section

37Dxx **Dynamical systems with hyperbolic behavior**

37D05 Hyperbolic orbits and sets

37D10 Invariant manifold theory

37D15 Morse-Smale systems

37D20 Uniformly hyperbolic systems (expanding, Anosov, Axiom A, etc.)

37D25 Nonuniformly hyperbolic systems (Lyapunov exponents, Pesin theory, etc.)

37D30 Partially hyperbolic systems and dominated splittings

37D35 Thermodynamic formalism, variational principles, equilibrium states

37D40 Dynamical systems of geometric origin and hyperbolicity (geodesic and horocycle flows, etc.)

37D45 Strange attractors, chaotic dynamics

37D50 Hyperbolic systems with singularities (billiards, etc.)

37D99 None of the above, but in this section

37Exx **Low-dimensional dynamical systems**

37E05 Maps of the interval (piecewise continuous, continuous, smooth)

37E10 Maps of the circle

37E15 Combinatorial dynamics (types of periodic orbits)

37E20 Universality, renormalization [See also 37F25]

37E25 Maps of trees and graphs

37E30 Homeomorphisms and diffeomorphisms of planes and surfaces

37E35 Flows on surfaces

37E40 Twist maps

37E45 Rotation numbers and vectors

37E99 None of the above, but in this section

37Fxx **Complex dynamical systems [See also 30D05, 32H50]**

37F05 Relations and correspondences

37F10 Polynomials; rational maps; entire and meromorphic functions [See also 32A10, 32A20, 32H02, 32H04]

37F15 Expanding maps; hyperbolicity; structural stability

37F20 Combinatorics and topology

37F25 Renormalization

37F30 Quasiconformal methods and Teichmüller theory; Fuchsian and Kleinian groups as dynamical systems

37F35 Conformal densities and Hausdorff dimension

37F40 Geometric limits

37F45 Holomorphic families of dynamical systems; the Mandelbrot set; bifurcations

37F50 Small divisors, rotation domains and linearization; Fatou and Julia sets

37F75 Holomorphic foliations and vector fields [See also 32M25, 32S65, 34Mxx]

37F99 None of the above, but in this section

37Gxx **Local and nonlocal bifurcation theory [See also 34C23, 34K18]**

37G05 Normal forms

37G10 Bifurcations of singular points

37G15 Bifurcations of limit cycles and periodic orbits

37G20 Hyperbolic singular points with homoclinic trajectories

37G25 Bifurcations connected with nontransversal intersection

37G30 Infinite nonwandering sets arising in bifurcations

37G35 Attractors and their bifurcations

37G40 Symmetries, equivariant bifurcation theory

37G99 None of the above, but in this section

37Hxx **Random dynamical systems [See also 15A52, 34D08, 34F05, 47B80, 70L05, 82C05, 93Exx]**

37H05 Foundations, general theory of cocycles, algebraic ergodic theory [See also 37Axx]

37H10 Generation, random and stochastic difference and differential equations [See also 34F05, 34K50, 60H10, 60H15]

37H15 Multiplicative ergodic theory, Lyapunov exponents [See also 34D08, 37Axx, 37Cxx, 37Dxx]

37H20 Bifurcation theory [See also 37Gxx]

37H99 None of the above, but in this section

37Jxx **Finite-dimensional Hamiltonian, Lagrangian, contact, and nonholonomic systems [See also 53Dxx, 70Fxx, 70Hxx]**

37J05 General theory, relations with symplectic geometry and topology

37J10 Symplectic mappings, fixed points

37J15 Symmetries, invariants, invariant manifolds, momentum maps, reduction [See also 53D20]

37J20 Bifurcation problems

37J25 Stability problems

37J30 Obstructions to integrability (nonintegrability criteria)

37J35 Completely integrable systems, topological structure of phase space, integration methods

37J40 Perturbations, normal forms, small divisors, KAM theory, Arnol′d diffusion

37J45 Periodic, homoclinic and heteroclinic orbits; variational methods, degree-theoretic methods

37J50 Action-minimizing orbits and measures

37J55 Contact systems [See also 53D10]

37J60 Nonholonomic dynamical systems [See also 70F25]

37J99 None of the above, but in this section

37Kxx **Infinite-dimensional Hamiltonian systems [See also 35Axx, 35Qxx]**
37K05 Hamiltonian structures, symmetries, variational principles, conservation laws
37K10 Completely integrable systems, integrability tests, bi-Hamiltonian structures, hierarchies (KdV, KP, Toda, etc.)
37K15 Integration of completely integrable systems by inverse spectral and scattering methods
37K20 Relations with algebraic geometry, complex analysis, special functions [See also 14H70]
37K25 Relations with differential geometry
37K30 Relations with infinite-dimensional Lie algebras and other algebraic structures
37K35 Lie-Bäcklund and other transformations
37K40 Soliton theory, asymptotic behavior of solutions
37K45 Stability problems
37K50 Bifurcation problems
37K55 Perturbations, KAM for infinite-dimensional systems
37K60 Lattice dynamics [See also 37L60]
37K65 Hamiltonian systems on groups of diffeomorphisms and on manifolds of mappings and metrics
37K99 None of the above, but in this section
37Lxx **Infinite-dimensional dissipative dynamical systems [See also 35Bxx, 35Qxx]**
37L05 General theory, nonlinear semigroups, evolution equations
37L10 Normal forms, center manifold theory, bifurcation theory
37L15 Stability problems
37L20 Symmetries
37L25 Inertial manifolds and other invariant attracting sets
37L30 Attractors and their dimensions, Lyapunov exponents
37L40 Invariant measures
37L45 Hyperbolicity; Lyapunov functions
37L50 Noncompact semigroups; dispersive equations; perturbations of Hamiltonian systems
37L55 Infinite-dimensional random dynamical systems; stochastic equations [See also 35R60, 60H10, 60H15]
37L60 Lattice dynamics [See also 37K60]
37L65 Special approximation methods (nonlinear Galerkin, etc.)
37L99 None of the above, but in this section
37Mxx **Approximation methods and numerical treatment of dynamical systems [See also 65Pxx]**
37M05 Simulation
37M10 Time series analysis
37M15 Symplectic integrators
37M20 Computational methods for bifurcation problems
37M25 Computational methods for ergodic theory (approximation of invariant measures, computation of Lyapunov exponents, entropy)

37M99 None of the above, but in this section
37Nxx **Applications**
37N05 Dynamical systems in classical and celestial mechanics [See mainly 70Fxx, 70Hxx, 70Kxx]
37N10 Dynamical systems in fluid mechanics, oceanography and meteorology [See mainly 76–XX, especially 76D05, 76F20, 86A05, 86A10]
37N15 Dynamical systems in solid mechanics [See mainly 74Hxx]
37N20 Dynamical systems in other branches of physics (quantum mechanics, general relativity, laser physics)
37N25 Dynamical systems in biology [See mainly 92–XX, but also 91–XX]
37N30 Dynamical systems in numerical analysis
37N35 Dynamical systems in control
37N40 Dynamical systems in optimization and economics
37N99 None of the above, but in this section
39–XX **DIFFERENCE AND FUNCTIONAL EQUATIONS**
39–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
39–01 Instructional exposition (textbooks, tutorial papers, etc.)
39–02 Research exposition (monographs, survey articles)
39–03 Historical (must also be assigned at least one classification number from Section 01)
39–04 Explicit machine computation and programs (not the theory of computation or programming)
39–06 Proceedings, conferences, collections, etc.
39Axx **Difference equations** {**For dynamical systems, see 37–XX**}
39A05 General
39A10 Difference equations, additive
39A11 Stability and asymptotics of difference equations; oscillatory and periodic solutions, etc.
39A12 Discrete version of topics in analysis
39A13 Difference equations, scaling (q-differences) [See also 33Dxx]
39A20 Multiplicative and other generalized difference equations, e.g. of Lyness type
39A70 Difference operators [See also 47B39]
39A99 None of the above, but in this section
39Bxx **Functional equations and inequalities [See also 30D05]**
39B05 General
39B12 Iteration theory, iterative and composite equations [See also 26A18, 30D05, 37–XX]
39B22 Equations for real functions [See also 26A51, 26B25]
39B32 Equations for complex functions [See also 30D05]
39B42 Matrix and operator equations [See also 47Jxx]
39B52 Equations for functions with more general domains and/or ranges

39B55	Orthogonal additivity and other conditional equations
39B62	Functional inequalities, including subadditivity, convexity, etc. [See also 26A51, 26B25, 26Dxx]
39B72	Systems of functional equations and inequalities
39B82	Stability, separation, extension, and related topics [See also 46A22]
39B99	None of the above, but in this section

40–XX   SEQUENCES, SERIES, SUMMABILITY

40–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
40–01	Instructional exposition (textbooks, tutorial papers, etc.)
40–02	Research exposition (monographs, survey articles)
40–03	Historical (must also be assigned at least one classification number from Section 01)
40–04	Explicit machine computation and programs (not the theory of computation or programming)
40–06	Proceedings, conferences, collections, etc.
40Axx	**Convergence and divergence of infinite limiting processes**
40A05	Convergence and divergence of series and sequences
40A10	Convergence and divergence of integrals
40A15	Convergence and divergence of continued fractions [See also 30B70]
40A20	Convergence and divergence of infinite products
40A25	Approximation to limiting values (summation of series, etc.) {For the Euler-Maclaurin summation formula, see 65B15}
40A30	Convergence and divergence of series and sequences of functions
40A99	None of the above, but in this section
40B05	**Multiple sequences and series (should also be assigned at least one other classification number in this section)**
40Cxx	**General summability methods**
40C05	Matrix methods
40C10	Integral methods
40C15	Function-theoretic methods (including power series methods and semicontinuous methods)
40C99	None of the above, but in this section
40Dxx	**Direct theorems on summability**
40D05	General theorems
40D09	Structure of summability fields
40D10	Tauberian constants and oscillation limits
40D15	Convergence factors and summability factors
40D20	Summability and bounded fields of methods
40D25	Inclusion and equivalence theorems
40D99	None of the above, but in this section
40Exx	**Inversion theorems**
40E05	Tauberian theorems, general
40E10	Growth estimates
40E15	Lacunary inversion theorems
40E20	Tauberian constants
40E99	None of the above, but in this section
40F05	**Absolute and strong summability**

40Gxx	**Special methods of summability**
40G05	Cesàro, Euler, Nörlund and Hausdorff methods
40G10	Abel, Borel and power series methods
40G99	None of the above, but in this section
40H05	**Functional analytic methods in summability**
40J05	**Summability in abstract structures [See also 43A55, 46A35, 46B15]**

41–XX   APPROXIMATIONS AND EXPANSIONS
{**For all approximation theory in the complex domain, see 30E05 and 30E10; for all trigonometric approximation and interpolation, see 42A10 and 42A15; for numerical approximation, see 65Dxx**}

41–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
41–01	Instructional exposition (textbooks, tutorial papers, etc.)
41–02	Research exposition (monographs, survey articles)
41–03	Historical (must also be assigned at least one classification number from Section 01)
41–04	Explicit machine computation and programs (not the theory of computation or programming)
41–06	Proceedings, conferences, collections, etc.
41A05	Interpolation [See also 42A15 and 65D05]
41A10	Approximation by polynomials {For approximation by trigonometric polynomials, see 42A10}
41A15	Spline approximation
41A17	Inequalities in approximation (Bernstein, Jackson, Nikol′skiĭ-type inequalities)
41A20	Approximation by rational functions
41A21	Padé approximation
41A25	Rate of convergence, degree of approximation
41A27	Inverse theorems
41A28	Simultaneous approximation
41A29	Approximation with constraints
41A30	Approximation by other special function classes
41A35	Approximation by operators (in particular, by integral operators)
41A36	Approximation by positive operators
41A40	Saturation
41A44	Best constants
41A45	Approximation by arbitrary linear expressions
41A46	Approximation by arbitrary nonlinear expressions; widths and entropy
41A50	Best approximation, Chebyshev systems
41A52	Uniqueness of best approximation
41A55	Approximate quadratures
41A58	Series expansions (e.g. Taylor, Lidstone series, but not Fourier series)
41A60	Asymptotic approximations, asymptotic expansions (steepest descent, etc.) [See also 30E15]
41A63	Multidimensional problems (should also be assigned at least one other classification number in this section)

41A65 Abstract approximation theory (approximation in normed linear spaces and other abstract spaces)

41A80 Remainders in approximation formulas

41A99 Miscellaneous topics

42–XX **FOURIER ANALYSIS**

42–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

42–01 Instructional exposition (textbooks, tutorial papers, etc.)

42–02 Research exposition (monographs, survey articles)

42–03 Historical (must also be assigned at least one classification number from Section 01)

42–04 Explicit machine computation and programs (not the theory of computation or programming)

42–06 Proceedings, conferences, collections, etc.

42Axx **Fourier analysis in one variable**

42A05 Trigonometric polynomials, inequalities, extremal problems

42A10 Trigonometric approximation

42A15 Trigonometric interpolation

42A16 Fourier coefficients, Fourier series of functions with special properties, special Fourier series {For automorphic theory, see mainly 11F30}

42A20 Convergence and absolute convergence of Fourier and trigonometric series

42A24 Summability and absolute summability of Fourier and trigonometric series

42A32 Trigonometric series of special types (positive coefficients, monotonic coefficients, etc.)

42A38 Fourier and Fourier-Stieltjes transforms and other transforms of Fourier type

42A45 Multipliers

42A50 Conjugate functions, conjugate series, singular integrals

42A55 Lacunary series of trigonometric and other functions; Riesz products

42A61 Probabilistic methods

42A63 Uniqueness of trigonometric expansions, uniqueness of Fourier expansions, Riemann theory, localization

42A65 Completeness of sets of functions

42A70 Trigonometric moment problems

42A75 Classical almost periodic functions, mean periodic functions [See also 43A60]

42A82 Positive definite functions

42A85 Convolution, factorization

42A99 None of the above, but in this section

42Bxx **Fourier analysis in several variables {For automorphic theory, see mainly 11F30}**

42B05 Fourier series and coefficients

42B08 Summability

42B10 Fourier and Fourier-Stieltjes transforms and other transforms of Fourier type

42B15 Multipliers

42B20 Singular integrals (Calderón-Zygmund, etc.)

42B25 Maximal functions, Littlewood-Paley theory

42B30 H^p-spaces

42B35 Function spaces arising in harmonic analysis

42B99 None of the above, but in this section

42Cxx **Nontrigonometric Fourier analysis**

42C05 Orthogonal functions and polynomials, general theory [See also 33C45, 33C50, 33D45]

42C10 Fourier series in special orthogonal functions (Legendre polynomials, Walsh functions, etc.)

42C15 Series of general orthogonal functions, generalized Fourier expansions, nonorthogonal expansions

42C20 Rearrangements and other transformations of Fourier and other orthogonal series

42C25 Uniqueness and localization for orthogonal series

42C30 Completeness of sets of functions

42C40 Wavelets

42C99 None of the above, but in this section

43–XX **ABSTRACT HARMONIC ANALYSIS {For other analysis on topological and Lie groups, see 22Exx}**

43–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

43–01 Instructional exposition (textbooks, tutorial papers, etc.)

43–02 Research exposition (monographs, survey articles)

43–03 Historical (must also be assigned at least one classification number from Section 01)

43–04 Explicit machine computation and programs (not the theory of computation or programming)

43–06 Proceedings, conferences, collections, etc.

43A05 Measures on groups and semigroups, etc.

43A07 Means on groups, semigroups, etc.; amenable groups

43A10 Measure algebras on groups, semigroups, etc.

43A15 L^p-spaces and other function spaces on groups, semigroups, etc.

43A17 Analysis on ordered groups, H^p-theory

43A20 L^1-algebras on groups, semigroups, etc.

43A22 Homomorphisms and multipliers of function spaces on groups, semigroups, etc.

43A25 Fourier and Fourier-Stieltjes transforms on locally compact abelian groups

43A30 Fourier and Fourier-Stieltjes transforms on nonabelian groups and on semigroups, etc.

43A32 Other transforms and operators of Fourier type

43A35 Positive definite functions on groups, semigroups, etc.

43A40 Character groups and dual objects

43A45 Spectral synthesis on groups, semigroups, etc.

43A46 Special sets (thin sets, Kronecker sets, Helson sets, Ditkin sets, Sidon sets, etc.)

43A50 Convergence of Fourier series and of inverse transforms

43A55 Summability methods on groups, semigroups, etc. [See also 40J05]

43A60   Almost periodic functions on groups and semigroups and their generalizations (recurrent functions, distal functions, etc.); almost automorphic functions

43A62   Hypergroups

43A65   Representations of groups, semigroups, etc. [See also 22A10, 22A20, 22Dxx, 22E45]

43A70   Analysis on specific locally compact abelian groups [See also 11R56, 22B05]

43A75   Analysis on specific compact groups

43A77   Analysis on general compact groups

43A80   Analysis on other specific Lie groups [See also 22Exx]

43A85   Analysis on homogeneous spaces

43A90   Spherical functions [See also 22E45, 22E46, 33C65]

43A95   Categorical methods [See also 46Mxx]

43A99   Miscellaneous topics

44–XX   INTEGRAL TRANSFORMS, OPERATIONAL CALCULUS {For fractional derivatives and integrals, see 26A33. For Fourier transforms, see 42A38, 42B10. For integral transforms in distribution spaces, see 46F12. For numerical methods, see 65R10}

44–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

44–01   Instructional exposition (textbooks, tutorial papers, etc.)

44–02   Research exposition (monographs, survey articles)

44–03   Historical (must also be assigned at least one classification number from Section 01)

44–04   Explicit machine computation and programs (not the theory of computation or programming)

44–06   Proceedings, conferences, collections, etc.

44A05   General transforms [See also 42A38]

44A10   Laplace transform

44A12   Radon transform [See also 92C55]

44A15   Special transforms (Legendre, Hilbert, etc.)

44A20   Transforms of special functions

44A30   Multiple transforms

44A35   Convolution

44A40   Calculus of Mikusiński and other operational calculi

44A45   Classical operational calculus

44A55   Discrete operational calculus

44A60   Moment problems

44A99   Miscellaneous topics

45–XX   INTEGRAL EQUATIONS

45–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

45–01   Instructional exposition (textbooks, tutorial papers, etc.)

45–02   Research exposition (monographs, survey articles)

45–03   Historical (must also be assigned at least one classification number from Section 01)

45–04   Explicit machine computation and programs (not the theory of computation or programming)

45–06   Proceedings, conferences, collections, etc.

45A05   Linear integral equations

45B05   Fredholm integral equations

45C05   Eigenvalue problems [See also 34Lxx, 35Pxx, 45P05, 47A75]

45D05   Volterra integral equations [See also 34A12]

45Exx   Singular integral equations [See also 30E20, 30E25, 44A15, 44A35]

45E05   Integral equations with kernels of Cauchy type [See also 35J15]

45E10   Integral equations of the convolution type (Abel, Picard, Toeplitz and Wiener-Hopf type) [See also 47B35]

45E99   None of the above, but in this section

45Fxx   Systems of linear integral equations

45F05   Systems of nonsingular linear integral equations

45F10   Dual, triple, etc., integral and series equations

45F15   Systems of singular linear integral equations

45F99   None of the above, but in this section

45Gxx   Nonlinear integral equations [See also 47H30, 47Jxx]

45G05   Singular nonlinear integral equations

45G10   Other nonlinear integral equations

45G15   Systems of nonlinear integral equations

45H05   Miscellaneous special kernels [See also 44A15]

45J05   Integro-ordinary differential equations [See also 34K05, 34K30, 47G20]

45K05   Integro-partial differential equations [See also 34K30, 35R10, 47G20]

45L05   Theoretical approximation of solutions {For numerical analysis, see 65Rxx}

45Mxx   Qualitative behavior

45M05   Asymptotics

45M10   Stability theory

45M15   Periodic solutions

45M20   Positive solutions

45M99   None of the above, but in this section

45N05   Abstract integral equations, integral equations in abstract spaces

45P05   Integral operators [See also 47B38, 47G10]

45Q05   Inverse problems

45R05   Random integral equations [See also 60H20]

46–XX   FUNCTIONAL ANALYSIS {For manifolds modeled on topological linear spaces, see 57Nxx, 58Bxx}

46–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

46–01   Instructional exposition (textbooks, tutorial papers, etc.)

46–02   Research exposition (monographs, survey articles)

46–03   Historical (must also be assigned at least one classification number from Section 01)

46–04   Explicit machine computation and programs (not the theory of computation or programming)

46–06   Proceedings, conferences, collections, etc.

46Axx   **Topological linear spaces and related structures {For function spaces, see 46Exx}**

46A03   General theory of locally convex spaces

46A04   Locally convex Fréchet spaces and (DF)-spaces

46A08   Barrelled spaces, bornological spaces

46A11   Spaces determined by compactness or summability properties (nuclear spaces, Schwartz spaces, Montel spaces, etc.)

46A13   Spaces defined by inductive or projective limits (LB, LF, etc.) [See also 46M40]

46A16   Not locally convex spaces (metrizable topological linear spaces, locally bounded spaces, quasi-Banach spaces, etc.)

46A17   Bornologies and related structures; Mackey convergence, etc.

46A19   Other "topological" linear spaces (convergence spaces, ranked spaces, spaces with a metric taking values in an ordered structure more general than $\mathbf{R}$, etc.)

46A20   Duality theory

46A22   Theorems of Hahn-Banach type; extension and lifting of functionals and operators [See also 46M10]

46A25   Reflexivity and semi-reflexivity [See also 46B10]

46A30   Open mapping and closed graph theorems; completeness (including B-, B_r-completeness)

46A32   Spaces of linear operators; topological tensor products; approximation properties [See also 46B28, 46M05, 47L05, 47L20]

46A35   Summability and bases [See also 46B15]

46A40   Ordered topological linear spaces, vector lattices [See also 06F20, 46B40, 46B42]

46A45   Sequence spaces (including Köthe sequence spaces) [See also 46B45]

46A50   Compactness in topological linear spaces; angelic spaces, etc.

46A55   Convex sets in topological linear spaces; Choquet theory [See also 52A07]

46A61   Graded Fréchet spaces and tame operators

46A63   Topological invariants ((DN), (Ω), etc.)

46A70   Saks spaces and their duals (strict topologies, mixed topologies, two-norm spaces, co-Saks spaces, etc.)

46A80   Modular spaces

46A99   None of the above, but in this section

46Bxx   **Normed linear spaces and Banach spaces; Banach lattices {For function spaces, see 46Exx}**

46B03   Isomorphic theory (including renorming) of Banach spaces

46B04   Isometric theory of Banach spaces

46B07   Local theory of Banach spaces

46B08   Ultraproduct techniques in Banach space theory [See also 46M07]

46B09   Probabilistic methods in Banach space theory [See also 60Bxx]

46B10   Duality and reflexivity [See also 46A25]

46B15   Summability and bases [See also 46A35]

46B20   Geometry and structure of normed linear spaces

46B22   Radon-Nikodým, Kreĭn-Milman and related properties [See also 46G10]

46B25   Classical Banach spaces in the general theory

46B26   Nonseparable Banach spaces

46B28   Spaces of operators; tensor products; approximation properties [See also 46A32, 46M05, 47L05, 47L20]

46B40   Ordered normed spaces [See also 46A40, 46B42]

46B42   Banach lattices [See also 46A40, 46B40]

46B45   Banach sequence spaces [See also 46A45]

46B50   Compactness in Banach (or normed) spaces

46B70   Interpolation between normed linear spaces [See also 46M35]

46B99   None of the above, but in this section

46Cxx   **Inner product spaces and their generalizations, Hilbert spaces {For function spaces, see 46Exx}**

46C05   Hilbert and pre-Hilbert spaces: geometry and topology (including spaces with semidefinite inner product)

46C07   Hilbert subspaces (= operator ranges); complementation (Aronszajn, de Branges, etc.) [See also 46B70, 46M35]

46C15   Characterizations of Hilbert spaces

46C20   Spaces with indefinite inner product (Kreĭn spaces, Pontryagin spaces, etc.) [See also 47B50]

46C50   Generalizations of inner products (semi-inner products, partial inner products, etc.)

46C99   None of the above, but in this section

46Exx   **Linear function spaces and their duals [See also 30H05, 32A38, 46F05] {For function algebras, see 46J10}**

46E05   Lattices of continuous, differentiable or analytic functions

46E10   Topological linear spaces of continuous, differentiable or analytic functions

46E15   Banach spaces of continuous, differentiable or analytic functions

46E20   Hilbert spaces of continuous, differentiable or analytic functions

46E22   Hilbert spaces with reproducing kernels (= [proper] functional Hilbert spaces, including de Branges-Rovnyak and other structured spaces) [See also 47B32]

46E25   Rings and algebras of continuous, differentiable or analytic functions {For Banach function algebras, see 46J10, 46J15}

46E27   Spaces of measures [See also 28A33, 46Gxx]

46E30   Spaces of measurable functions (L^p-spaces, Orlicz spaces, Köthe function spaces, Lorentz spaces, rearrangement invariant spaces, ideal spaces, etc.)

46E35   Sobolev spaces and other spaces of "smooth" functions, embedding theorems, trace theorems

46E39   Sobolev (and similar kinds of) spaces of functions of discrete variables

46E40   Spaces of vector- and operator-valued functions

46E50 Spaces of differentiable or holomorphic functions on infinite-dimensional spaces [See also 46G20, 46G25, 47H60]

46E99 None of the above, but in this section

46Fxx Distributions, generalized functions, distribution spaces [See also 46T30]

46F05 Topological linear spaces of test functions, distributions and ultradistributions [See also 46E10, 46E35]

46F10 Operations with distributions

46F12 Integral transforms in distribution spaces [See also 42–XX, 44–XX]

46F15 Hyperfunctions, analytic functionals [See also 32A25, 32A45, 32C35, 58J15]

46F20 Distributions and ultradistributions as boundary values of analytic functions [See also 30D40, 30E25, 32A40]

46F25 Distributions on infinite-dimensional spaces [See also 58C35]

46F30 Generalized functions for nonlinear analysis (Rosinger, Colombeau, nonstandard, etc.)

46F99 None of the above, but in this section

46Gxx Measures, integration, derivative, holomorphy (all involving infinite-dimensional spaces) [See also 28–XX, 46Txx]

46G05 Derivatives [See also 46T20, 58C20, 58C25]

46G10 Vector-valued measures and integration [See also 28Bxx, 46B22]

46G12 Measures and integration on abstract linear spaces [See also 28C20, 46T12]

46G15 Functional analytic lifting theory [See also 28A51]

46G20 Infinite-dimensional holomorphy [See also 32–XX, 46E50, 46T25, 58B12, 58C10]

46G25 (Spaces of) multilinear mappings, polynomials [See also 46E50, 46G20, 47H60]

46G99 None of the above, but in this section

46Hxx Topological algebras, normed rings and algebras, Banach algebras {For group algebras, convolution algebras and measure algebras, see 43A10, 43A20}

46H05 General theory of topological algebras

46H10 Ideals and subalgebras

46H15 Representations of topological algebras

46H20 Structure, classification of topological algebras

46H25 Normed modules and Banach modules, topological modules (if not placed in 13–XX or 16–XX)

46H30 Functional calculus in topological algebras [See also 47A60]

46H35 Topological algebras of operators [See mainly 47Lxx]

46H40 Automatic continuity

46H70 Nonassociative topological algebras [See also 46K70, 46L70]

46H99 None of the above, but in this section

46Jxx Commutative Banach algebras and commutative topological algebras [See also 46E25]

46J05 General theory of commutative topological algebras

46J10 Banach algebras of continuous functions, function algebras [See also 46E25]

46J15 Banach algebras of differentiable or analytic functions, H^p-spaces [See also 30D55, 30H05, 32A35, 32A37, 32A38, 42B30]

46J20 Ideals, maximal ideals, boundaries

46J25 Representations of commutative topological algebras

46J30 Subalgebras

46J40 Structure, classification of commutative topological algebras

46J45 Radical Banach algebras

46J99 None of the above, but in this section

46Kxx Topological (rings and) algebras with an involution [See also 16W10]

46K05 General theory of topological algebras with involution

46K10 Representations of topological algebras with involution

46K15 Hilbert algebras

46K50 Nonselfadjoint (sub)algebras in algebras with involution

46K70 Nonassociative topological algebras with an involution [See also 46H70, 46L70]

46K99 None of the above, but in this section

46Lxx Selfadjoint operator algebras (C^*-algebras, von Neumann (W^*-) algebras, etc.) [See also 22D25, 47Lxx]

46L05 General theory of C^*-algebras

46L06 Tensor products of C^*-algebras

46L07 Operator spaces and completely bounded maps [See also 47L25]

46L08 C^*-modules

46L09 Free products of C^*-algebras

46L10 General theory of von Neumann algebras

46L30 States

46L35 Classifications of C^*-algebras, factors

46L37 Subfactors and their classification

46L40 Automorphisms

46L45 Decomposition theory for C^*-algebras

46L51 Noncommutative measure and integration

46L52 Noncommutative function spaces

46L53 Noncommutative probability and statistics

46L54 Free probability and free operator algebras

46L55 Noncommutative dynamical systems [See also 28Dxx, 37Kxx, 37Lxx, 54H20]

46L57 Derivations, dissipations and positive semigroups in C^*-algebras

46L60 Applications of selfadjoint operator algebras to physics [See also 46N50, 46N55, 47L90, 81T05, 82B10, 82C10]

46L65 Quantizations, deformations

46L70 Nonassociative selfadjoint operator algebras [See also 46H70, 46K70]

46L80 K-theory and operator algebras (including cyclic theory) [See also 18F25, 19Kxx, 46M20, 55Rxx, 58J22]

46L85 Noncommutative topology [See also 58B32, 58B34, 58J22]

46L87 Noncommutative differential geometry [See also 58B32, 58B34, 58J22]

46L89 Other "noncommutative" mathematics based on C^*-algebra theory [See also 58B32, 58B34, 58J22]

46L99 None of the above, but in this section

46Mxx **Methods of category theory in functional analysis [See also 18–XX]**

46M05 Tensor products [See also 46A32, 46B28, 47A80]

46M07 Ultraproducts [See also 46B08, 46S20]

46M10 Projective and injective objects [See also 46A22]

46M15 Categories, functors {For K-theory, EXT, etc., see 19K33, 46L80, 46M18, 46M20}

46M18 Homological methods (exact sequences, right inverses, lifting, etc.)

46M20 Methods of algebraic topology (cohomology, sheaf and bundle theory, etc.) [See also 14F05, 18Fxx, 19Kxx, 32Cxx, 32Lxx, 46L80, 46M15, 46M18, 55Rxx]

46M35 Abstract interpolation of topological vector spaces [See also 46B70]

46M40 Inductive and projective limits [See also 46A13]

46M99 None of the above, but in this section

46Nxx **Miscellaneous applications of functional analysis [See also 47Nxx]**

46N10 Applications in optimization, convex analysis, mathematical programming, economics

46N20 Applications to differential and integral equations

46N30 Applications in probability theory and statistics

46N40 Applications in numerical analysis [See also 65Jxx]

46N50 Applications in quantum physics

46N55 Applications in statistical physics

46N60 Applications in biology and other sciences

46N99 None of the above, but in this section

46Sxx **Other (nonclassical) types of functional analysis [See also 47Sxx]**

46S10 Functional analysis over fields other than $\mathbf{R}$ or $\mathbf{C}$ or the quaternions; non-Archimedean functional analysis [See also 12J25, 32P05]

46S20 Nonstandard functional analysis [See also 03H05]

46S30 Constructive functional analysis [See also 03F60]

46S40 Fuzzy functional analysis [See also 03E72]

46S50 Functional analysis in probabilistic metric linear spaces

46S60 Functional analysis on superspaces (supermanifolds) or graded spaces [See also 58A50 and 58C50]

46S99 None of the above, but in this section

46Txx **Nonlinear functional analysis [See also 47Hxx, 47Jxx, 58Cxx, 58Dxx]**

46T05 Infinite-dimensional manifolds [See also 53Axx, 57N20, 58Bxx, 58Dxx]

46T10 Manifolds of mappings

46T12 Measure (Gaussian, cylindrical, etc.) and integrals (Feynman, path, Fresnel, etc.) on manifolds [See also 28Cxx, 46G12, 60–XX]

46T20 Continuous and differentiable maps [See also 46G05]

46T25 Holomorphic maps [See also 46G20]

46T30 Distributions and generalized functions on nonlinear spaces [See also 46Fxx]

46T99 None of the above, but in this section

47–XX **OPERATOR THEORY**

47–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

47–01 Instructional exposition (textbooks, tutorial papers, etc.)

47–02 Research exposition (monographs, survey articles)

47–03 Historical (must also be assigned at least one classification number from Section 01)

47–04 Explicit machine computation and programs (not the theory of computation or programming)

47–06 Proceedings, conferences, collections, etc.

47Axx **General theory of linear operators**

47A05 General (adjoints, conjugates, products, inverses, domains, ranges, etc.)

47A06 Linear relations (multivalued linear operators)

47A07 Forms (bilinear, sesquilinear, multilinear)

47A10 Spectrum, resolvent

47A11 Local spectral properties

47A12 Numerical range, numerical radius

47A13 Several-variable operator theory (spectral, Fredholm, etc.)

47A15 Invariant subspaces

47A16 Cyclic and hypercyclic vectors

47A20 Dilations, extensions, compressions

47A25 Spectral sets

47A30 Norms (inequalities, more than one norm, etc.)

47A35 Ergodic theory [See also 28Dxx, 37Axx]

47A40 Scattering theory [See also 34L25, 35P25, 81Uxx]

47A45 Canonical models for contractions and nonselfadjoint operators

47A46 Chains (nests) of projections or of invariant subspaces, integrals along chains, etc.

47A48 Operator colligations (= nodes), vessels, linear systems, characteristic functions, realizations, etc.

47A50 Equations and inequalities involving linear operators, with vector unknowns

47A52 Ill-posed problems, regularization

47A53 (Semi-) Fredholm operators; index theories [See also 58B15, 58J20]

47A55 Perturbation theory

47A56 Functions whose values are linear operators (operator and matrix valued functions, etc., including analytic and meromorphic ones)

47A57 Operator methods in interpolation, moment and extension problems [See also 30E05, 42A70, 42A82, 44A60]

47A58 Operator approximation theory

47A60 Functional calculus

47A62 Equations involving linear operators, with operator unknowns

47A63 Operator inequalities

47A64 Operator means, shorted operators, etc.

47A65 Structure theory

47A66 Quasitriangular and nonquasitriangular, quasidiagonal and nonquasidiagonal operators

47A67 Representation theory

47A68 Factorization theory (including Wiener-Hopf and spectral factorizations)

47A70 (Generalized) eigenfunction expansions; rigged Hilbert spaces

47A75 Eigenvalue problems [See also 49R50]

47A80 Tensor products of operators [See also 46M05]

47A99 None of the above, but in this section

47Bxx   Special classes of linear operators

47B06 Riesz operators; eigenvalue distributions; approximation numbers, s-numbers, Kolmogorov numbers, entropy numbers, etc. of operators

47B07 Operators defined by compactness properties

47B10 Operators belonging to operator ideals (nuclear, p-summing, in the Schatten-von Neumann classes, etc.) [See also 47L20]

47B15 Hermitian and normal operators (spectral measures, functional calculus, etc.)

47B20 Subnormal operators, hyponormal operators, etc.

47B25 Symmetric and selfadjoint operators (unbounded)

47B32 Operators in reproducing-kernel Hilbert spaces (including de Branges, de Branges-Rovnyak, and other structured spaces) [See also 46E22]

47B33 Composition operators

47B34 Kernel operators

47B35 Toeplitz operators, Hankel operators, Wiener-Hopf operators [See also 45P05, 47G10 for other integral operators; see also 32A25, 32M15]

47B36 Jacobi (tridiagonal) operators (matrices) and generalizations

47B37 Operators on special spaces (weighted shifts, operators on sequence spaces, etc.)

47B38 Operators on function spaces (general)

47B39 Difference operators [See also 39A70]

47B40 Spectral operators, decomposable operators, well-bounded operators, etc.

47B44 Accretive operators, dissipative operators, etc.

47B47 Commutators, derivations, elementary operators, etc.

47B48 Operators on Banach algebras

47B49 Transformers (= operators on spaces of operators)

47B50 Operators on spaces with an indefinite metric [See also 46C50]

47B60 Operators on ordered spaces

47B65 Positive operators and order-bounded operators

47B80 Random operators [See also 60H25]

47B99 None of the above, but in this section

47Cxx   Individual linear operators as elements of algebraic systems

47C05 Operators in algebras

47C10 Operators in $*$-algebras

47C15 Operators in C^*- or von Neumann algebras

47C99 None of the above, but in this section

47Dxx   Groups and semigroups of linear operators, their generalizations and applications

47D03 Groups and semigroups of linear operators {For nonlinear operators, see 47H20; see also 20M20}

47D06 One-parameter semigroups and linear evolution equations [See also 34G10, 34K30]

47D07 Markov semigroups and applications to diffusion processes {For Markov processes, see 60Jxx}

47D08 Schrödinger and Feynman-Kac semigroups

47D09 Operator sine and cosine functions and higher-order Cauchy problems [See also 34G10]

47D60 C-semigroups

47D62 Integrated semigroups

47D99 None of the above, but in this section

47E05   Ordinary differential operators [See also 34Bxx, 34Lxx]

47F05   Partial differential operators [See also 35Pxx, 58Jxx]

47Gxx   Integral, integro-differential, and pseudodifferential operators [See also 58Jxx]

47G10 Integral operators [See also 45P05]

47G20 Integro-differential operators [See also 34K30, 35R10, 45J05, 45K05]

47G30 Pseudodifferential operators [See also 35Sxx, 58Jxx]

47G99 None of the above, but in this section

47Hxx   Nonlinear operators and their properties {For global and geometric aspects, see 58–XX, especially 58Cxx}

47H04 Set-valued operators [See also 28B20, 54C60, 58C06]

47H05 Monotone operators (with respect to duality)

47H06 Accretive operators, dissipative operators, etc.

47H07 Monotone and positive operators on ordered Banach spaces or other ordered topological vector spaces

47H09 Nonexpansive mappings, and their generalizations (ultimately compact mappings, measures of noncompactness and condensing mappings, A-proper mappings, K-set contractions, etc.)

47H10 Fixed-point theorems [See also 54H25, 55M20, 58C30]

47H11 Degree theory [See also 55M25, 58C30]

47H14 Perturbations of nonlinear operators

47H20 Semigroups of nonlinear operators

47H30 Particular nonlinear operators (superposition, Hammerstein, Nemytskiĭ, Uryson, etc.) [See also 45Gxx, 45P05]

47H40 Random operators [See also 60H25]

47H50 Potential operators

47H60 Multilinear and polynomial operators [See also 46G25]

47H99 None of the above, but in this section

47Jxx **Equations and inequalities involving nonlinear operators [See also 46Txx] {For global and geometric aspects, see 58–XX}**

47J05 Equations involving nonlinear operators (general)

47J06 Nonlinear ill-posed problems

47J07 Abstract inverse mapping and implicit function theorems [See also 46T20 and 58C15]

47J10 Nonlinear eigenvalue problems

47J15 Abstract bifurcation theory [See also 58E07, 58E09]

47J20 Variational and other types of inequalities involving nonlinear operators (general)

47J25 Methods for solving nonlinear operator equations (general)

47J30 Variational methods [See also 58Exx]

47J35 Nonlinear evolution equations [See also 34G20, 35K90, 35L90, 35Qxx, 35R20, 37Kxx, 37Lxx, 58D25]

47J40 Equations with hysteresis operators

47J99 None of the above, but in this section

47Lxx **Linear spaces and algebras of operators [See also 46Lxx]**

47L05 Linear spaces of operators [See also 46A32 and 46B28]

47L07 Convex sets and cones of operators [See also 46A55]

47L10 Algebras of operators on Banach spaces and other topological linear spaces

47L15 Operator algebras with symbol structure

47L20 Operator ideals

47L25 Operator spaces (= matricially normed spaces) [See also 46L07]

47L30 Abstract operator algebras on Hilbert spaces

47L35 Nest algebras, CSL algebras

47L40 Limit algebras, subalgebras of C^*-algebras

47L45 Dual algebras; weakly closed singly generated operator algebras

47L50 Dual spaces of operator algebras

47L55 Representations of (nonselfadjoint) operator algebras

47L60 Algebras of unbounded operators; partial algebras of operators

47L65 Crossed product algebras (analytic crossed products)

47L70 Nonassociative nonselfadjoint operator algebras

47L75 Other nonselfadjoint operator algebras

47L80 Algebras of specific types of operators (Toeplitz, integral, pseudodifferential, etc.)

47L90 Applications of operator algebras to physics

47L99 None of the above, but in this section

47Nxx **Miscellaneous applications of operator theory [See also 46Nxx]**

47N10 Applications in optimization, convex analysis, mathematical programming, economics

47N20 Applications to differential and integral equations

47N30 Applications in probability theory and statistics

47N40 Applications in numerical analysis [See also 65Jxx]

47N50 Applications in quantum physics

47N55 Applications in statistical physics

47N60 Applications in biology and other sciences

47N70 Applications in systems theory, circuits, etc.

47N99 None of the above, but in this section

47Sxx **Other (nonclassical) types of operator theory [See also 46Sxx]**

47S10 Operator theory over fields other than **R**, **C** or the quaternions; non-Archimedean operator theory

47S20 Nonstandard operator theory [See also 03H05]

47S30 Constructive operator theory [See also 03F60]

47S40 Fuzzy operator theory [See also 03E72]

47S50 Operator theory in probabilistic metric linear spaces

47S99 None of the above, but in this section

49–XX **CALCULUS OF VARIATIONS AND OPTIMAL CONTROL; OPTIMIZATION [See also 34H05, 34K35, 65Kxx, 90Cxx, 93–XX]**

49–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

49–01 Instructional exposition (textbooks, tutorial papers, etc.)

49–02 Research exposition (monographs, survey articles)

49–03 Historical (must also be assigned at least one classification number from Section 01)

49–04 Explicit machine computation and programs (not the theory of computation or programming)

49–06 Proceedings, conferences, collections, etc.

49Jxx **Existence theories**

49J05 Free problems in one independent variable

49J10 Free problems in two or more independent variables

49J15 Optimal control problems involving ordinary differential equations

49J20 Optimal control problems involving partial differential equations

49J22 Optimal control problems involving integral equations

49J24 Optimal control problems involving differential inclusions [See also 34A60]

49J25 Optimal control problems involving equations with retarded arguments [See also 34K35]

49J27 Problems in abstract spaces [See also 90C48, 93C25]

49J30 Optimal solutions belonging to restricted classes (Lipschitz controls, bang-bang controls, etc.)

49J35 Minimax problems

49J40   Variational methods including variational inequalities [See also 47J20]

49J45   Methods involving semicontinuity and convergence; relaxation

49J50   Fréchet and Gateaux differentiability [See also 46G05, 58C20]

49J52   Nonsmooth analysis [See also 46G05, 58C50]

49J53   Set-valued and variational analysis [See also 28B20, 47H04, 54C60, 58C06]

49J55   Problems involving randomness [See also 93E20]

49J99   None of the above, but in this section

49Kxx   Necessary conditions and sufficient conditions for optimality

49K05   Free problems in one independent variable

49K10   Free problems in two or more independent variables

49K15   Problems involving ordinary differential equations

49K20   Problems involving partial differential equations

49K22   Problems involving integral equations

49K24   Problems involving differential inclusions [See also 34A60]

49K25   Problems involving equations with retarded arguments [See also 34K35]

49K27   Problems in abstract spaces [See also 90C48, 93C25]

49K30   Optimal solutions belonging to restricted classes

49K35   Minimax problems

49K40   Sensitivity, stability, well-posedness [See also 90C31]

49K45   Problems involving randomness [See also 93E20]

49K99   None of the above, but in this section

49Lxx   Hamilton-Jacobi theories, including dynamic programming

49L20   Dynamic programming method

49L25   Viscosity solutions

49L99   None of the above, but in this section

49Mxx   Methods of successive approximations [See also 90Cxx, 65Kxx]

49M05   Methods based on necessary conditions

49M15   Methods of Newton-Raphson, Galerkin and Ritz types

49M20   Methods of relaxation type

49M25   Discrete approximations

49M27   Decomposition methods

49M29   Methods involving duality

49M30   Other methods, not based on necessary conditions (penalty function, etc.)

49M37   Methods of nonlinear programming type [See also 90C30, 65Kxx]

49M99   None of the above, but in this section

49Nxx   Miscellaneous topics

49N05   Linear optimal control problems [See also 93C05]

49N10   Linear-quadratic problems

49N15   Duality theory

49N20   Periodic optimization

49N25   Impulsive optimal control problems

49N30   Problems with incomplete information [See also 93C41]

49N35   Optimal feedback synthesis [See also 93B52]

49N45   Inverse problems

49N60   Regularity of solutions

49N70   Differential games

49N75   Pursuit and evasion games

49N90   Applications of optimal control and differential games [See also 90C90, 93C95]

49N99   None of the above, but in this section

49Qxx   Manifolds [See also 58Exx]

49Q05   Minimal surfaces [See also 53A10, 58E12]

49Q10   Optimization of shapes other than minimal surfaces [See also 90C90]

49Q12   Sensitivity analysis

49Q15   Geometric measure and integration theory, integral and normal currents [See also 28A75, 32C30, 58A25, 58C35]

49Q20   Variational problems in a geometric measure-theoretic setting

49Q99   None of the above, but in this section

49R50   Variational methods for eigenvalues of operators [See also 47A75]

49S05   Variational principles of physics

51–XX   GEOMETRY {For algebraic geometry, see 14–XX}

51–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

51–01   Instructional exposition (textbooks, tutorial papers, etc.)

51–02   Research exposition (monographs, survey articles)

51–03   Historical (must also be assigned at least one classification number from Section 01)

51–04   Explicit machine computation and programs (not the theory of computation or programming)

51–06   Proceedings, conferences, collections, etc.

51Axx   Linear incidence geometry

51A05   General theory and projective geometries

51A10   Homomorphism, automorphism and dualities

51A15   Structures with parallelism

51A20   Configuration theorems

51A25   Algebraization [See also 12Kxx, 20N05]

51A30   Desarguesian and Pappian geometries

51A35   Non-Desarguesian affine and projective planes

51A40   Translation planes and spreads

51A45   Incidence structures imbeddable into projective geometries

51A50   Polar geometry, symplectic spaces, orthogonal spaces

51A99   None of the above, but in this section

51Bxx   Nonlinear incidence geometry

51B05   General theory

51B10   Möbius geometries

51B15   Laguerre geometries

51B20   Minkowski geometries

51B25   Lie geometries

51B99   None of the above, but in this section

51C05	**Ring geometry (Hjelmslev, Barbilian, etc.)**
51Dxx	**Geometric closure systems**
51D05	Abstract (Maeda) geometries
51D10	Abstract geometries with exchange axiom
51D15	Abstract geometries with parallelism
51D20	Combinatorial geometries [See also 05B25, 05B35]
51D25	Lattices of subspaces [See also 05B35]
51D30	Continuous geometries and related topics [See also 06Cxx]
51D99	None of the above, but in this section
51Exx	**Finite geometry and special incidence structures**
51E05	General block designs [See also 05B05]
51E10	Steiner systems
51E12	Generalized quadrangles, generalized polygons
51E14	Finite partial geometries (general), nets, partial spreads
51E15	Affine and projective planes
51E20	Combinatorial structures in finite projective spaces [See also 05Bxx]
51E21	Blocking sets, ovals, k-arcs
51E22	Linear codes and caps in Galois spaces [See also 94B05]
51E23	Spreads and packing problems
51E24	Buildings and the geometry of diagrams
51E25	Other finite nonlinear geometries
51E26	Other finite linear geometries
51E30	Other finite incidence structures [See also 05B30]
51E99	None of the above, but in this section
51Fxx	**Metric geometry**
51F05	Absolute planes
51F10	Absolute spaces
51F15	Reflection groups, reflection geometries [See also 20H10, 20H15; for Coxeter groups, see 20F55]
51F20	Congruence and orthogonality [See also 20H05]
51F25	Orthogonal and unitary groups [See also 20H05]
51F99	None of the above, but in this section
51G05	**Ordered geometries (ordered incidence structures, etc.)**
51Hxx	**Topological geometry**
51H05	General theory
51H10	Topological linear incidence structures
51H15	Topological nonlinear incidence structures
51H20	Topological geometries on manifolds [See also 57–XX]
51H25	Geometries with differentiable structure [See also 53Cxx, 53C70]
51H30	Geometries with algebraic manifold structure [See also 14–XX]
51H99	None of the above, but in this section
51Jxx	**Incidence groups**
51J05	General theory
51J10	Projective incidence groups
51J15	Kinematic spaces
51J20	Representation by near-fields and near-algebras [See also 12K05, 16Y30]
51J99	None of the above, but in this section
51Kxx	**Distance geometry**
51K05	General theory
51K10	Synthetic differential geometry
51K99	None of the above, but in this section
51Lxx	**Geometric order structures [See also 53C75]**
51L05	Geometry of orders of nondifferentiable curves
51L10	Directly differentiable curves
51L15	n-vertex theorems via direct methods
51L20	Geometry of orders of surfaces
51L99	None of the above, but in this section
51Mxx	**Real and complex geometry**
51M04	Elementary problems in Euclidean geometries
51M05	Euclidean geometries (general) and generalizations
51M09	Elementary problems in hyperbolic and elliptic geometries
51M10	Hyperbolic and elliptic geometries (general) and generalizations
51M15	Geometric constructions
51M16	Inequalities and extremum problems {For convex problems, see 52A40}
51M20	Polyhedra and polytopes; regular figures, division of spaces [See also 51F15]
51M25	Length, area and volume [See also 26B15]
51M30	Line geometries and their generalizations [See also 53A25]
51M35	Synthetic treatment of fundamental manifolds in projective geometries (Grassmannians, Veronesians and their generalizations) [See also 14M15]
51M99	None of the above, but in this section
51Nxx	**Analytic and descriptive geometry**
51N05	Descriptive geometry [See also 65D17, 68U07]
51N10	Affine analytic geometry
51N15	Projective analytic geometry
51N20	Euclidean analytic geometry
51N25	Analytic geometry with other transformation groups
51N30	Geometry of classical groups [See also 20Gxx, 14L35]
51N35	Questions of classical algebraic geometry [See also 14Nxx]
51N99	None of the above, but in this section
51P05	**Geometry and physics (should also be assigned at least one other classification number from Sections 70–86)**
52–XX	**CONVEX AND DISCRETE GEOMETRY**
52–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
52–01	Instructional exposition (textbooks, tutorial papers, etc.)
52–02	Research exposition (monographs, survey articles)
52–03	Historical (must also be assigned at least one classification number from Section 01)
52–04	Explicit machine computation and programs (not the theory of computation or programming)

52–06   Proceedings, conferences, collections, etc.

52Axx   **General convexity**

52A01   Axiomatic and generalized convexity

52A05   Convex sets without dimension restrictions

52A07   Convex sets in topological vector spaces [See also 46A55]

52A10   Convex sets in 2 dimensions (including convex curves) [See also 53A04]

52A15   Convex sets in 3 dimensions (including convex surfaces) [See also 53A05, 53C45]

52A20   Convex sets in n dimensions (including convex hypersurfaces) [See also 53A07, 53C45]

52A21   Finite-dimensional Banach spaces (including special norms, zonoids, etc.) [See also 46Bxx]

52A22   Random convex sets and integral geometry [See also 53C65, 60D05]

52A27   Approximation by convex sets

52A30   Variants of convex sets (star-shaped, (m,n)-convex, etc.)

52A35   Helly-type theorems and geometric transversal theory

52A37   Other problems of combinatorial convexity

52A38   Length, area, volume [See also 26B15, 28A75, 49Q20]

52A39   Mixed volumes and related topics

52A40   Inequalities and extremum problems

52A41   Convex functions and convex programs [See also 26B25, 90C25]

52A55   Spherical and hyperbolic convexity

52A99   None of the above, but in this section

52Bxx   **Polytopes and polyhedra**

52B05   Combinatorial properties (number of faces, shortest paths, etc.) [See also 05Cxx]

52B10   Three-dimensional polytopes

52B11 n-dimensional polytopes

52B12   Special polytopes (linear programming, centrally symmetric, etc.)

52B15   Symmetry properties of polytopes

52B20   Lattice polytopes (including relations with commutative algebra and algebraic geometry) [See also 06A11, 13F20, 13Hxx]

52B22   Shellability

52B35   Gale and other diagrams

52B40   Matroids (realizations in the context of convex polytopes, convexity in combinatorial structures, etc.) [See also 05B35, 52Cxx]

52B45   Dissections and valuations (Hilbert's third problem, etc.)

52B55   Computational aspects related to convexity {For computational geometry and algorithms, see 68Q25, 68U05; for numerical algorithms, see 65Yxx} [See also 68Uxx]

52B60   Isoperimetric problems for polytopes

52B70   Polyhedral manifolds

52B99   None of the above, but in this section

52Cxx   **Discrete geometry**

52C05   Lattices and convex bodies in 2 dimensions [See also 11H06, 11H31, 11P21]

52C07   Lattices and convex bodies in n dimensions [See also 11H06, 11H31, 11P21]

52C10   Erdős problems and related topics of discrete geometry [See also 11Hxx]

52C15   Packing and covering in 2 dimensions [See also 05B40, 11H31]

52C17   Packing and covering in n dimensions [See also 05B40, 11H31]

52C20   Tilings in 2 dimensions [See also 05B45, 51M20]

52C22   Tilings in n dimensions [See also 05B45, 51M20]

52C23   Quasicrystals, aperiodic tilings

52C25   Rigidity and flexibility of structures [See also 70B15]

52C26   Circle packings and discrete conformal geometry

52C30   Planar arrangements of lines and pseudolines

52C35   Arrangements of points, flats, hyperplanes [See also 32S22]

52C40   Oriented matroids

52C45   Combinatorial complexity of geometric structures [See also 68U05]

52C99   None of the above, but in this section

53–XX   **DIFFERENTIAL GEOMETRY {For differential topology, see 57Rxx. For foundational questions of differentiable manifolds, see 58Axx}**

53–00   General reference works (handbooks, dictionaries, bibliographies, etc.)

53–01   Instructional exposition (textbooks, tutorial papers, etc.)

53–02   Research exposition (monographs, survey articles)

53–03   Historical (must also be assigned at least one classification number from Section 01)

53–04   Explicit machine computation and programs (not the theory of computation or programming)

53–06   Proceedings, conferences, collections, etc.

53Axx   **Classical differential geometry**

53A04   Curves in Euclidean space

53A05   Surfaces in Euclidean space

53A07   Higher-dimensional and -codimensional surfaces in Euclidean n-space

53A10   Minimal surfaces, surfaces with prescribed mean curvature [See also 49Q05, 49Q10, 53C42]

53A15   Affine differential geometry

53A17   Kinematics

53A20   Projective differential geometry

53A25   Differential line geometry

53A30   Conformal differential geometry

53A35   Non-Euclidean differential geometry

53A40   Other special differential geometries

53A45   Vector and tensor analysis

53A55   Differential invariants (local theory), geometric objects

53A60   Geometry of webs [See also 14C21, 20N05]

53A99   None of the above, but in this section

53Bxx   **Local differential geometry**

53B05   Linear and affine connections

53B10   Projective connections

53B15 Other connections
53B20 Local Riemannian geometry
53B21 Methods of Riemannian geometry
53B25 Local submanifolds [See also 53C40]
53B30 Lorentz metrics, indefinite metrics
53B35 Hermitian and Kählerian structures [See also 32Cxx]
53B40 Finsler spaces and generalizations (areal metrics)
53B50 Applications to physics
53B99 None of the above, but in this section
53Cxx **Global differential geometry [See also 51H25, 58–XX; for related bundle theory, see 55Rxx, 57Rxx]**
53C05 Connections, general theory
53C07 Special connections and metrics on vector bundles (Hermite-Einstein-Yang-Mills) [See also 32Q20]
53C10 G-structures
53C12 Foliations (differential geometric aspects) [See also 57R30, 57R32]
53C15 General geometric structures on manifolds (almost complex, almost product structures, etc.)
53C17 Sub-Riemannian geometry
53C20 Global Riemannian geometry, including pinching [See also 31C12, 58B20]
53C21 Methods of Riemannian geometry, including PDE methods; curvature restrictions [See also 58J60]
53C22 Geodesics [See also 58E10]
53C23 Global topological methods (à la Gromov)
53C24 Rigidity results
53C25 Special Riemannian manifolds (Einstein, Sasakian, etc.)
53C26 Hyper-Kähler and quaternionic Kähler geometry, "special" geometry
53C27 Spin and Spin^c geometry
53C28 Twistor methods [See also 32L25]
53C29 Issues of holonomy
53C30 Homogeneous manifolds [See also 14M15, 14M17, 32M10, 57T15]
53C35 Symmetric spaces [See also 32M15, 57T15]
53C38 Calibrations and calibrated geometries
53C40 Global submanifolds [See also 53B25]
53C42 Immersions (minimal, prescribed curvature, tight, etc.) [See also 49Q05, 49Q10, 53A10, 57R40, 57R42]
53C43 Differential geometric aspects of harmonic maps [See also 58E20]
53C44 Geometric evolution equations (mean curvature flow)
53C45 Global surface theory (convex surfaces à la A. D. Aleksandrov)
53C50 Lorentz manifolds, manifolds with indefinite metrics
53C55 Hermitian and Kählerian manifolds [See also 32Cxx]
53C56 Other complex differential geometry [See also 32Cxx]

53C60 Finsler spaces and generalizations (areal metrics) [See also 58B20]
53C65 Integral geometry [See also 52A22, 60D05]; differential forms, currents, etc. [See mainly 58Axx]
53C70 Direct methods (G-spaces of Busemann, etc.)
53C75 Geometric orders, order geometry [See also 51Lxx]
53C80 Applications to physics
53C99 None of the above, but in this section
53Dxx **Symplectic geometry, contact geometry [See also 37Jxx, 70Gxx, 70Hxx]**
53D05 Symplectic manifolds, general
53D10 Contact manifolds, general
53D12 Lagrangian submanifolds; Maslov index
53D15 Almost contact and almost symplectic manifolds
53D17 Poisson manifolds
53D20 Momentum maps; symplectic reduction
53D22 Canonical transformations
53D25 Geodesic flows
53D30 Symplectic structures of moduli spaces
53D35 Global theory of symplectic and contact manifolds [See also 57Rxx]
53D40 Floer homology and cohomology, symplectic aspects
53D45 Gromov-Witten invariants, quantum cohomology, Frobenius manifolds [See also 14N35]
53D50 Geometric quantization
53D55 Deformation quantization, star products
53D99 None of the above, but in this section
53Z05 **Applications to physics**
54–XX **GENERAL TOPOLOGY {For the topology of manifolds of all dimensions, see 57Nxx}**
54–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
54–01 Instructional exposition (textbooks, tutorial papers, etc.)
54–02 Research exposition (monographs, survey articles)
54–03 Historical (must also be assigned at least one classification number from Section 01)
54–04 Explicit machine computation and programs (not the theory of computation or programming)
54–06 Proceedings, conferences, collections, etc.
54Axx **Generalities**
54A05 Topological spaces and generalizations (closure spaces, etc.)
54A10 Several topologies on one set (change of topology, comparison of topologies, lattices of topologies)
54A15 Syntopogeneous structures
54A20 Convergence in general topology (sequences, filters, limits, convergence spaces, etc.)
54A25 Cardinality properties (cardinal functions and inequalities, discrete subsets) [See also 03Exx] {For ultrafilters, see 54D80}
54A35 Consistency and independence results [See also 03E35]

54A40 Fuzzy topology [See also 03E72]
54A99 None of the above, but in this section
54Bxx **Basic constructions**
54B05 Subspaces
54B10 Product spaces
54B15 Quotient spaces, decompositions
54B17 Adjunction spaces and similar constructions
54B20 Hyperspaces
54B30 Categorical methods [See also 18B30]
54B35 Spectra
54B40 Presheaves and sheaves [See also 18F20]
54B99 None of the above, but in this section
54Cxx **Maps and general types of spaces defined by maps**
54C05 Continuous maps
54C08 Weak and generalized continuity
54C10 Special maps on topological spaces (open, closed, perfect, etc.)
54C15 Retraction
54C20 Extension of maps
54C25 Embedding
54C30 Real-valued functions [See also 26–XX]
54C35 Function spaces [See also 46Exx, 58D15]
54C40 Algebraic properties of function spaces [See also 46J10]
54C45 C- and C^*-embedding
54C50 Special sets defined by functions [See also 26A21]
54C55 Absolute neighborhood extensor, absolute extensor, absolute neighborhood retract (ANR), absolute retract spaces (general properties) [See also 55M15]
54C56 Shape theory [See also 55P55, 57N25]
54C60 Set-valued maps [See also 26E25, 28B20, 47H04, 58C06]
54C65 Selections [See also 28B20]
54C70 Entropy
54C99 None of the above, but in this section
54Dxx **Fairly general properties**
54D05 Connected and locally connected spaces (general aspects)
54D10 Lower separation axioms (T_0–T_3, etc.)
54D15 Higher separation axioms (completely regular, normal, perfectly or collectionwise normal, etc.)
54D20 Noncompact covering properties (paracompact, Lindelöf, etc.)
54D25 "P-minimal" and "P-closed" spaces
54D30 Compactness
54D35 Extensions of spaces (compactifications, supercompactifications, completions, etc.)
54D40 Remainders
54D45 Local compactness, σ-compactness
54D50 k-spaces
54D55 Sequential spaces
54D60 Realcompactness and realcompactification
54D65 Separability
54D70 Base properties

54D80 Special constructions of spaces (spaces of ultrafilters, etc.)
54D99 None of the above, but in this section
54Exx **Spaces with richer structures**
54E05 Proximity structures and generalizations
54E15 Uniform structures and generalizations
54E17 Nearness spaces
54E18 p-spaces, M-spaces, σ-spaces, etc.
54E20 Stratifiable spaces, cosmic spaces, etc.
54E25 Semimetric spaces
54E30 Moore spaces
54E35 Metric spaces, metrizability
54E40 Special maps on metric spaces
54E45 Compact (locally compact) metric spaces
54E50 Complete metric spaces
54E52 Baire category, Baire spaces
54E55 Bitopologies
54E70 Probabilistic metric spaces
54E99 None of the above, but in this section
54Fxx **Special properties**
54F05 Linearly ordered topological spaces, generalized ordered spaces, and partially ordered spaces [See also 06B30, 06F30]
54F15 Continua and generalizations
54F35 Higher-dimensional local connectedness [See also 55Mxx, 55Nxx]
54F45 Dimension theory [See also 55M10]
54F50 Spaces of dimension ≤ 1; curves, dendrites [See also 26A03]
54F55 Unicoherence, multicoherence
54F65 Topological characterizations of particular spaces
54F99 None of the above, but in this section
54Gxx **Peculiar spaces**
54G05 Extremally disconnected spaces, F-spaces, etc.
54G10 P-spaces
54G12 Scattered spaces
54G15 Pathological spaces
54G20 Counterexamples
54G99 None of the above, but in this section
54Hxx **Connections with other structures, applications**
54H05 Descriptive set theory (topological aspects of Borel, analytic, projective, etc. sets) [See also 03E15, 26A21, 28A05]
54H10 Topological representations of algebraic systems [See also 22–XX]
54H11 Topological groups [See also 22A05]
54H12 Topological lattices, etc. [See also 06B30, 06F30]
54H13 Topological fields, rings, etc. [See also 12Jxx] {For algebraic aspects, see 13Jxx, 16W80}
54H15 Transformation groups and semigroups [See also 20M20, 22–XX, 57Sxx]
54H20 Topological dynamics [See also 28Dxx, 37Bxx]
54H25 Fixed-point and coincidence theorems [See also 47H10, 55M20]
54H99 None of the above, but in this section
54J05 **Nonstandard topology [See also 03H05]**

55–XX **ALGEBRAIC TOPOLOGY**
55–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
55–01 Instructional exposition (textbooks, tutorial papers, etc.)
55–02 Research exposition (monographs, survey articles)
55–03 Historical (must also be assigned at least one classification number from Section 01)
55–04 Explicit machine computation and programs (not the theory of computation or programming)
55–06 Proceedings, conferences, collections, etc.
55Mxx **Classical topics {For the topology of Euclidean spaces and manifolds, see 57Nxx}**
55M05 Duality
55M10 Dimension theory [See also 54F45]
55M15 Absolute neighborhood retracts [See also 54C55]
55M20 Fixed points and coincidences [See also 54H25]
55M25 Degree, winding number
55M30 Ljusternik-Schnirelman (Lyusternik-Shnirel′man) category of a space
55M35 Finite groups of transformations (including Smith theory) [See also 57S17]
55M99 None of the above, but in this section
55Nxx **Homology and cohomology theories [See also 57Txx]**
55N05 Čech types
55N07 Steenrod-Sitnikov homologies
55N10 Singular theory
55N15 K-theory [See also 19Lxx] {For algebraic K-theory, see 18F25, 19–XX}
55N20 Generalized (extraordinary) homology and cohomology theories
55N22 Bordism and cobordism theories, formal group laws [See also 14L05, 19L41, 57R75, 57R77, 57R85, 57R90]
55N25 Homology with local coefficients, equivariant cohomology
55N30 Sheaf cohomology [See also 18F20, 32C35, 32L10]
55N33 Intersection homology and cohomology
55N34 Elliptic cohomology
55N35 Other homology theories
55N40 Axioms for homology theory and uniqueness theorems
55N45 Products and intersections
55N91 Equivariant homology and cohomology [See also 19L47]
55N99 None of the above, but in this section
55Pxx **Homotopy theory {For simple homotopy type, see 57Q10}**
55P05 Homotopy extension properties, cofibrations
55P10 Homotopy equivalences
55P15 Classification of homotopy type
55P20 Eilenberg-Mac Lane spaces
55P25 Spanier-Whitehead duality
55P30 Eckmann-Hilton duality
55P35 Loop spaces
55P40 Suspensions

55P42 Stable homotopy theory, spectra
55P43 Spectra with additional structure (E_∞, A_∞, ring spectra, etc.)
55P45 H-spaces and duals
55P47 Infinite loop spaces
55P48 Loop space machines, operads [See also 18D50]
55P55 Shape theory [See also 54C56, 55Q07]
55P57 Proper homotopy theory
55P60 Localization and completion
55P62 Rational homotopy theory
55P65 Homotopy functors
55P91 Equivariant homotopy theory [See also 19L47]
55P92 Relations between equivariant and nonequivariant homotopy theory
55P99 None of the above, but in this section
55Qxx **Homotopy groups**
55Q05 Homotopy groups, general; sets of homotopy classes
55Q07 Shape groups
55Q10 Stable homotopy groups
55Q15 Whitehead products and generalizations
55Q20 Homotopy groups of wedges, joins, and simple spaces
55Q25 Hopf invariants
55Q35 Operations in homotopy groups
55Q40 Homotopy groups of spheres
55Q45 Stable homotopy of spheres
55Q50 J-morphism [See also 19L20]
55Q51 v_n-periodicity
55Q52 Homotopy groups of special spaces
55Q55 Cohomotopy groups
55Q70 Homotopy groups of special types [See also 55N05, 55N07]
55Q91 Equivariant homotopy groups [See also 19L47]
55Q99 None of the above, but in this section
55Rxx **Fiber spaces and bundles [See also 18F15, 32Lxx, 46M20, 57R20, 57R22, 57R25]**
55R05 Fiber spaces
55R10 Fiber bundles
55R12 Transfer
55R15 Classification
55R20 Spectral sequences and homology of fiber spaces [See also 55Txx]
55R25 Sphere bundles and vector bundles
55R35 Classifying spaces of groups and H-spaces
55R37 Maps between classifying spaces
55R40 Homology of classifying spaces, characteristic classes [See also 57Txx, 57R20]
55R45 Homology and homotopy of BO and BU; Bott periodicity
55R50 Stable classes of vector space bundles, K-theory [See also 19Lxx] {For algebraic K-theory, see 18F25, 19–XX}
55R55 Fiberings with singularities
55R60 Microbundles and block bundles [See also 57N55, 57Q50]
55R65 Generalizations of fiber spaces and bundles
55R70 Fibrewise topology

55R80   Discriminantal varieties, configuration spaces
55R91   Equivariant fiber spaces and bundles [See also 19L47]
55R99   None of the above, but in this section

55Sxx   Operations and obstructions
55S05   Primary cohomology operations
55S10   Steenrod algebra
55S12   Dyer-Lashof operations
55S15   Symmetric products, cyclic products
55S20   Secondary and higher cohomology operations
55S25 K-theory operations and generalized cohomology operations [See also 19D55, 19Lxx]
55S30   Massey products
55S35   Obstruction theory
55S36   Extension and compression of mappings
55S37   Classification of mappings
55S40   Sectioning fiber spaces and bundles
55S45   Postnikov systems, k-invariants
55S91   Equivariant operations and obstructions [See also 19L47]
55S99   None of the above, but in this section

55Txx   Spectral sequences [See also 18G40, 55R20]
55T05   General
55T10   Serre spectral sequences
55T15   Adams spectral sequences
55T20   Eilenberg-Moore spectral sequences [See also 57T35]
55T25   Generalized cohomology
55T99   None of the above, but in this section

55Uxx   Applied homological algebra and category theory [See also 18Gxx]
55U05   Abstract complexes
55U10   Simplicial sets and complexes
55U15   Chain complexes
55U20   Universal coefficient theorems, Bockstein operator
55U25   Homology of a product, Künneth formula
55U30   Duality
55U35   Abstract and axiomatic homotopy theory
55U40   Topological categories, foundations of homotopy theory
55U99   None of the above, but in this section

57–XX   MANIFOLDS AND CELL COMPLEXES {For complex manifolds, see 32Qxx}
57–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
57–01   Instructional exposition (textbooks, tutorial papers, etc.)
57–02   Research exposition (monographs, survey articles)
57–03   Historical (must also be assigned at least one classification number from Section 01)
57–04   Explicit machine computation and programs (not the theory of computation or programming)
57–06   Proceedings, conferences, collections, etc.

57Mxx   Low-dimensional topology
57M05   Fundamental group, presentations, free differential calculus

57M07   Topological methods in group theory
57M10   Covering spaces
57M12   Special coverings, e.g. branched
57M15   Relations with graph theory [See also 05Cxx]
57M20   Two-dimensional complexes
57M25   Knots and links in S^3 {For higher dimensions, see 57Q45}
57M27   Invariants of knots and 3-manifolds
57M30   Wild knots and surfaces, etc., wild embeddings
57M35   Dehn's lemma, sphere theorem, loop theorem, asphericity
57M40   Characterizations of E^3 and S^3 (Poincaré conjecture) [See also 57N12]
57M50   Geometric structures on low-dimensional manifolds
57M60   Group actions in low dimensions
57M99   None of the above, but in this section

57Nxx   Topological manifolds
57N05   Topology of E^2, 2-manifolds
57N10   Topology of general 3-manifolds [See also 57Mxx]
57N12   Topology of E^3 and S^3 [See also 57M40]
57N13   Topology of E^4, 4-manifolds [See also 14Jxx, 32Jxx]
57N15   Topology of E^n, n-manifolds ($4 < n < \infty$)
57N16   Geometric structures on manifolds [See also 57M50]
57N17   Topology of topological vector spaces
57N20   Topology of infinite-dimensional manifolds [See also 58Bxx]
57N25   Shapes [See also 54C56, 55P55, 55Q07]
57N30   Engulfing
57N35   Embeddings and immersions
57N37   Isotopy and pseudo-isotopy
57N40   Neighborhoods of submanifolds
57N45   Flatness and tameness
57N50 $S^{n-1} \subset E^n$, Schoenflies problem
57N55   Microbundles and block bundles [See also 55R60, 57Q50]
57N60   Cellularity
57N65   Algebraic topology of manifolds
57N70   Cobordism and concordance
57N75   General position and transversality
57N80   Stratifications
57N99   None of the above, but in this section

57Pxx   Generalized manifolds [See also 18F15]
57P05   Local properties of generalized manifolds
57P10   Poincaré duality spaces
57P99   None of the above, but in this section

57Qxx   PL-topology
57Q05   General topology of complexes
57Q10   Simple homotopy type, Whitehead torsion, Reidemeister-Franz torsion, etc. [See also 19B28]
57Q12   Wall finiteness obstruction for CW-complexes
57Q15   Triangulating manifolds
57Q20   Cobordism
57Q25   Comparison of PL-structures: classification, Hauptvermutung

57Q30 Engulfing
57Q35 Embeddings and immersions
57Q37 Isotopy
57Q40 Regular neighborhoods
57Q45 Knots and links (in high dimensions) {For the low-dimensional case, see 57M25}
57Q50 Microbundles and block bundles [See also 55R60, 57N55]
57Q55 Approximations
57Q60 Cobordism and concordance
57Q65 General position and transversality
57Q91 Equivariant PL-topology
57Q99 None of the above, but in this section
57Rxx **Differential topology {For foundational questions of differentiable manifolds, see 58Axx; for infinite-dimensional manifolds, see 58Bxx}**
57R05 Triangulating
57R10 Smoothing
57R12 Smooth approximations
57R15 Specialized structures on manifolds (spin manifolds, framed manifolds, etc.)
57R17 Symplectic and contact topology
57R19 Algebraic topology on manifolds
57R20 Characteristic classes and numbers
57R22 Topology of vector bundles and fiber bundles [See also 55Rxx]
57R25 Vector fields, frame fields
57R27 Controllability of vector fields on C^∞ and real-analytic manifolds [See also 49Qxx, 37C10, 93B05]
57R30 Foliations; geometric theory
57R32 Classifying spaces for foliations; Gel'fand-Fuks cohomology [See also 58H10]
57R35 Differentiable mappings
57R40 Embeddings
57R42 Immersions
57R45 Singularities of differentiable mappings
57R50 Diffeomorphisms
57R52 Isotopy
57R55 Differentiable structures
57R56 Topological quantum field theories
57R57 Applications of global analysis to structures on manifolds, Donaldson and Seiberg-Witten invariants [See also 58–XX]
57R58 Floer homology
57R60 Homotopy spheres, Poincaré conjecture
57R65 Surgery and handlebodies
57R67 Surgery obstructions, Wall groups [See also 19J25]
57R70 Critical points and critical submanifolds
57R75 O- and SO-cobordism
57R77 Complex cobordism (U- and SU-cobordism) [See also 55N22]
57R80 h- and s-cobordism
57R85 Equivariant cobordism
57R90 Other types of cobordism [See also 55N22]
57R91 Equivariant algebraic topology of manifolds

57R95 Realizing cycles by submanifolds
57R99 None of the above, but in this section
57Sxx **Topological transformation groups [See also 20F34, 22–XX, 37–XX, 54H15, 58D05]**
57S05 Topological properties of groups of homeomorphisms or diffeomorphisms
57S10 Compact groups of homeomorphisms
57S15 Compact Lie groups of differentiable transformations
57S17 Finite transformation groups
57S20 Noncompact Lie groups of transformations
57S25 Groups acting on specific manifolds
57S30 Discontinuous groups of transformations
57S99 None of the above, but in this section
57Txx **Homology and homotopy of topological groups and related structures**
57T05 Hopf algebras [See also 16W30]
57T10 Homology and cohomology of Lie groups
57T15 Homology and cohomology of homogeneous spaces of Lie groups
57T20 Homotopy groups of topological groups and homogeneous spaces
57T25 Homology and cohomology of H-spaces
57T30 Bar and cobar constructions [See also 18G55, 55Uxx]
57T35 Applications of Eilenberg-Moore spectral sequences [See also 55R20, 55T20]
57T99 None of the above, but in this section
58–XX **GLOBAL ANALYSIS, ANALYSIS ON MANIFOLDS {For geometric integration theory, see 49Q15}**
58–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
58–01 Instructional exposition (textbooks, tutorial papers, etc.)
58–02 Research exposition (monographs, survey articles)
58–03 Historical (must also be assigned at least one classification number from Section 01)
58–04 Explicit machine computation and programs (not the theory of computation or programming)
58–06 Proceedings, conferences, collections, etc.
58Axx **General theory of differentiable manifolds [See also 32Cxx]**
58A03 Topos-theoretic approach to differentiable manifolds
58A05 Differentiable manifolds, foundations
58A07 Real-analytic and Nash manifolds [See also 14P20, 32C07]
58A10 Differential forms
58A12 de Rham theory [See also 14Fxx]
58A14 Hodge theory [See also 14C30, 14Fxx, 32J25, 32S35]
58A15 Exterior differential systems (Cartan theory)
58A17 Pfaffian systems
58A20 Jets
58A25 Currents [See also 32C30, 53C65]

58A30   Vector distributions (subbundles of the tangent bundles)

58A32   Natural bundles

58A35   Stratified sets [See also 32S60]

58A40   Differential spaces

58A50   Supermanifolds and graded manifolds [See also 14A22, 32C11]

58A99   None of the above, but in this section

58Bxx   Infinite-dimensional manifolds

58B05   Homotopy and topological questions

58B10   Differentiability questions

58B12   Questions of holomorphy [See also 32–XX, 46G20]

58B15   Fredholm structures [See also 47A53]

58B20   Riemannian, Finsler and other geometric structures [See also 53C20, 53C60]

58B25   Group structures and generalizations on infinite-dimensional manifolds [See also 22E65, 58D05]

58B32   Geometry of quantum groups

58B34   Noncommutative geometry (à la Connes)

58B99   None of the above, but in this section

58Cxx   Calculus on manifolds; nonlinear operators [See also 46Txx, 47Hxx, 47Jxx]

58C05   Real-valued functions

58C06   Set valued and function-space valued mappings [See also 47H04, 54C60]

58C07   Continuity properties of mappings

58C10   Holomorphic maps [See also 32–XX]

58C15   Implicit function theorems; global Newton methods

58C20   Differentiation theory (Gateaux, Fréchet, etc.) [See also 26Exx, 46G05]

58C25   Differentiable maps

58C30   Fixed point theorems on manifolds [See also 47H10]

58C35   Integration on manifolds; measures on manifolds [See also 28Cxx]

58C40   Spectral theory; eigenvalue problems [See also 47J10, 58E07]

58C50   Analysis on supermanifolds or graded manifolds

58C99   None of the above, but in this section

58Dxx   Spaces and manifolds of mappings (including nonlinear versions of 46Exx) [See also 46Txx, 53Cxx]

58D05   Groups of diffeomorphisms and homeomorphisms as manifolds [See also 22E65, 57S05]

58D07   Groups and semigroups of nonlinear operators [See also 17B65, 47H20]

58D10   Spaces of imbeddings and immersions

58D15   Manifolds of mappings [See also 46T10, 54C35]

58D17   Manifolds of metrics (esp. Riemannian)

58D19   Group actions and symmetry properties

58D20   Measures (Gaussian, cylindrical, etc.) on manifolds of maps [See also 28Cxx, 46T12]

58D25   Equations in function spaces; evolution equations [See also 34Gxx, 35K90, 35L90, 35R15, 37Lxx, 47Jxx]

58D27   Moduli problems for differential geometric structures

58D29   Moduli problems for topological structures

58D30   Applications (in quantum mechanics (Feynman path integrals), relativity, fluid dynamics, etc.)

58D99   None of the above, but in this section

58Exx   Variational problems in infinite-dimensional spaces

58E05   Abstract critical point theory (Morse theory, Ljusternik-Schnirelman (Lyusternik-Shnirel′man) theory, etc.)

58E07   Abstract bifurcation theory

58E09   Group-invariant bifurcation theory

58E10   Applications to the theory of geodesics (problems in one independent variable)

58E11   Critical metrics

58E12   Applications to minimal surfaces (problems in two independent variables) [See also 49Q05]

58E15   Application to extremal problems in several variables; Yang-Mills functionals [See also 81T13], etc.

58E17   Pareto optimality, etc., applications to economics [See also 90C29]

58E20   Harmonic maps [See also 53C43], etc.

58E25   Applications to control theory [See also 49–XX, 93–XX]

58E30   Variational principles

58E35   Variational inequalities (global problems)

58E40   Group actions

58E50   Applications

58E99   None of the above, but in this section

58Hxx   Pseudogroups, differentiable groupoids and general structures on manifolds

58H05   Pseudogroups and differentiable groupoids [See also 22A22, 22E65]

58H10   Cohomology of classifying spaces for pseudogroup structures (Spencer, Gel′fand-Fuks, etc.) [See also 57R32]

58H15   Deformations of structures [See also 32Gxx, 58J10]

58H99   None of the above, but in this section

58Jxx   Partial differential equations on manifolds; differential operators [See also 32Wxx, 35–XX, 53Cxx]

58J05   Elliptic equations on manifolds, general theory [See also 35–XX]

58J10   Differential complexes [See also 35Nxx]; elliptic complexes

58J15   Relations with hyperfunctions

58J20   Index theory and related fixed point theorems [See also 19K56, 46L80]

58J22   Exotic index theories [See also 19K56, 46L05, 46L10, 46L80, 46M20]

58J26   Elliptic genera

58J28   Eta-invariants, Chern-Simons invariants

58J30   Spectral flows

58J32   Boundary value problems on manifolds

58J35   Heat and other parabolic equation methods

58J37 Perturbations; asymptotics
58J40 Pseudodifferential and Fourier integral operators on manifolds [See also 35Sxx]
58J42 Noncommutative global analysis, noncommutative residues
58J45 Hyperbolic equations [See also 35Lxx]
58J47 Propagation of singularities; initial value problems
58J50 Spectral problems; spectral geometry; scattering theory [See also 35Pxx]
58J52 Determinants and determinant bundles, analytic torsion
58J53 Isospectrality
58J55 Bifurcation [See also 35B32]
58J60 Relations with special manifold structures (Riemannian, Finsler, etc.)
58J65 Diffusion processes and stochastic analysis on manifolds [See also 35R60, 60H10, 60J60]
58J70 Invariance and symmetry properties [See also 35A30]
58J72 Correspondences and other transformation methods (e.g. Lie-Bäcklund) [See also 35A22]
58J90 Applications
58J99 None of the above, but in this section
58Kxx **Theory of singularities and catastrophe theory [See also 32Sxx, 37–XX]**
58K05 Critical points of functions and mappings
58K10 Monodromy
58K15 Topological properties of mappings
58K20 Algebraic and analytic properties of mappings
58K25 Stability
58K30 Global theory
58K35 Catastrophe theory
58K40 Classification; finite determinacy of map germs
58K45 Singularities of vector fields, topological aspects
58K50 Normal forms
58K55 Asymptotic behavior
58K60 Deformation of singularities
58K65 Topological invariants
58K70 Symmetries, equivariance
58K99 None of the above, but in this section
58Z05 **Applications to physics**

60–XX **PROBABILITY THEORY AND STOCHASTIC PROCESSES {For additional applications, see 11Kxx, 62–XX, 90–XX, 91–XX, 92–XX, 93–XX, 94–XX}**
60–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
60–01 Instructional exposition (textbooks, tutorial papers, etc.)
60–02 Research exposition (monographs, survey articles)
60–03 Historical (must also be assigned at least one classification number from Section 01)
60–04 Explicit machine computation and programs (not the theory of computation or programming)
60–06 Proceedings, conferences, collections, etc.

60–08 Computational methods (not classified at a more specific level) [See also 65C50]
60Axx **Foundations of probability theory**
60A05 Axioms; other general questions
60A10 Probabilistic measure theory {For ergodic theory, see 28Dxx and 60Fxx}
60A99 None of the above, but in this section
60Bxx **Probability theory on algebraic and topological structures**
60B05 Probability measures on topological spaces
60B10 Convergence of probability measures
60B11 Probability theory on linear topological spaces [See also 28C20]
60B12 Limit theorems for vector-valued random variables (infinite-dimensional case)
60B15 Probability measures on groups, Fourier transforms, factorization
60B99 None of the above, but in this section
60C05 **Combinatorial probability**
60D05 **Geometric probability, stochastic geometry, random sets [See also 52A22, 53C65]**
60Exx **Distribution theory [See also 62Exx, 62Hxx]**
60E05 Distributions: general theory
60E07 Infinitely divisible distributions; stable distributions
60E10 Characteristic functions; other transforms
60E15 Inequalities; stochastic orderings
60E99 None of the above, but in this section
60Fxx **Limit theorems [See also 28Dxx, 60B12]**
60F05 Central limit and other weak theorems
60F10 Large deviations
60F15 Strong theorems
60F17 Functional limit theorems; invariance principles
60F20 Zero-one laws
60F25 L^p-limit theorems
60F99 None of the above, but in this section
60Gxx **Stochastic processes**
60G05 Foundations of stochastic processes
60G07 General theory of processes
60G09 Exchangeability
60G10 Stationary processes
60G12 General second-order processes
60G15 Gaussian processes
60G17 Sample path properties
60G18 Self-similar processes
60G20 Generalized stochastic processes
60G25 Prediction theory [See also 62M20]
60G30 Continuity and singularity of induced measures
60G35 Applications (signal detection, filtering, etc.) [See also 62M20, 93E10, 93E11, 94Axx]
60G40 Stopping times; optimal stopping problems; gambling theory [See also 62L15, 91A60]
60G42 Martingales with discrete parameter
60G44 Martingales with continuous parameter
60G46 Martingales and classical analysis
60G48 Generalizations of martingales
60G50 Sums of independent random variables; random walks

60G51 Processes with independent increments
60G52 Stable processes
60G55 Point processes
60G57 Random measures
60G60 Random fields
60G70 Extreme value theory; extremal processes
60G99 None of the above, but in this section
60Hxx **Stochastic analysis [See also 58J65]**
60H05 Stochastic integrals
60H07 Stochastic calculus of variations and the Malliavin calculus
60H10 Stochastic ordinary differential equations [See also 34F05]
60H15 Stochastic partial differential equations [See also 35R60]
60H20 Stochastic integral equations
60H25 Random operators and equations [See also 47B80]
60H30 Applications of stochastic analysis (to PDE, etc.)
60H35 Computational methods for stochastic equations [See also 65C30]
60H40 White noise theory
60H99 None of the above, but in this section
60Jxx **Markov processes**
60J05 Markov processes with discrete parameter
60J10 Markov chains with discrete parameter
60J20 Applications of discrete Markov processes (social mobility, learning theory, industrial processes, etc.) [See also 90B30, 91D10, 91D35, 91E40]
60J22 Computational methods in Markov chains [See also 65C40]
60J25 Markov processes with continuous parameter
60J27 Markov chains with continuous parameter
60J35 Transition functions, generators and resolvents [See also 47D03, 47D07]
60J40 Right processes
60J45 Probabilistic potential theory [See also 31Cxx, 31D05]
60J50 Boundary theory
60J55 Local time and additive functionals
60J57 Multiplicative functionals
60J60 Diffusion processes [See also 58J65]
60J65 Brownian motion [See also 58J65]
60J70 Applications of diffusion theory (population genetics, absorption problems, etc.) [See also 92Dxx]
60J75 Jump processes
60J80 Branching processes (Galton-Watson, birth-and-death, etc.)
60J85 Applications of branching processes [See also 92Dxx]
60J99 None of the above, but in this section
60Kxx **Special processes**
60K05 Renewal theory
60K10 Applications (reliability, demand theory, etc.)
60K15 Markov renewal processes, semi-Markov processes

60K20 Applications of Markov renewal processes (reliability, queueing networks, etc.) [See also 90Bxx]
60K25 Queueing theory [See also 68M20, 90B22]
60K30 Applications (congestion, allocation, storage, traffic, etc.) [See also 90Bxx]
60K35 Interacting random processes; statistical mechanics type models; percolation theory [See also 82B43, 82C43]
60K37 Processes in random environments
60K40 Other physical applications of random processes
60K99 None of the above, but in this section
62–XX **STATISTICS**
62–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
62–01 Instructional exposition (textbooks, tutorial papers, etc.)
62–02 Research exposition (monographs, survey articles)
62–03 Historical (must also be assigned at least one classification number from Section 01)
62–04 Explicit machine computation and programs (not the theory of computation or programming)
62–06 Proceedings, conferences, collections, etc.
62–07 Data analysis
62–09 Graphical methods
62A01 **Foundational and philosophical topics**
62Bxx **Sufficiency and information**
62B05 Sufficient statistics and fields
62B10 Information-theoretic topics [See also 94A17]
62B15 Theory of statistical experiments
62B99 None of the above, but in this section
62Cxx **Decision theory [See also 90B50, 91B06; for game theory, see 91A35]**
62C05 General considerations
62C07 Complete class results
62C10 Bayesian problems; characterization of Bayes procedures
62C12 Empirical decision procedures; empirical Bayes procedures
62C15 Admissibility
62C20 Minimax procedures
62C25 Compound decision problems
62C99 None of the above, but in this section
62D05 **Sampling theory, sample surveys**
62Exx **Distribution theory [See also 60Exx]**
62E10 Characterization and structure theory
62E15 Exact distribution theory
62E17 Approximations to distributions (nonasymptotic)
62E20 Asymptotic distribution theory
62E99 None of the above, but in this section
62Fxx **Parametric inference**
62F03 Hypothesis testing
62F05 Asymptotic properties of tests
62F07 Ranking and selection
62F10 Point estimation
62F12 Asymptotic properties of estimators
62F15 Bayesian inference

62F25   Tolerance and confidence regions
62F30   Inference under constraints
62F35   Robustness and adaptive procedures
62F40   Bootstrap, jackknife and other resampling methods
62F99   None of the above, but in this section
62Gxx   **Nonparametric inference**
62G05   Estimation
62G07   Density estimation
62G08   Nonparametric regression
62G09   Resampling methods
62G10   Hypothesis testing
62G15   Tolerance and confidence regions
62G20   Asymptotic properties
62G30   Order statistics; empirical distribution functions
62G32   Statistics of extreme values; tail inference
62G35   Robustness
62G99   None of the above, but in this section
62Hxx   **Multivariate analysis [See also 60Exx]**
62H05   Characterization and structure theory
62H10   Distribution of statistics
62H11   Directional data; spatial statistics
62H12   Estimation
62H15   Hypothesis testing
62H17   Contingency tables
62H20   Measures of association (correlation, canonical correlation, etc.)
62H25   Factor analysis and principal components; correspondence analysis
62H30   Classification and discrimination; cluster analysis [See also 68T10]
62H35   Image analysis
62H99   None of the above, but in this section
62Jxx   **Linear inference, regression**
62J02   General nonlinear regression
62J05   Linear regression
62J07   Ridge regression; shrinkage estimators
62J10   Analysis of variance and covariance
62J12   Generalized linear models
62J15   Paired and multiple comparisons
62J20   Diagnostics
62J99   None of the above, but in this section
62Kxx   **Design of experiments [See also 05Bxx]**
62K05   Optimal designs
62K10   Block designs
62K15   Factorial designs
62K20   Response surface designs
62K25   Robust parameter designs
62K99   None of the above, but in this section
62Lxx   **Sequential methods**
62L05   Sequential design
62L10   Sequential analysis
62L12   Sequential estimation
62L15   Optimal stopping [See also 60G40, 91A60]
62L20   Stochastic approximation
62L99   None of the above, but in this section

62Mxx   **Inference from stochastic processes**
62M02   Markov processes: hypothesis testing
62M05   Markov processes: estimation
62M07   Non-Markovian processes: hypothesis testing
62M09   Non-Markovian processes: estimation
62M10   Time series, auto-correlation, regression, etc. [See also 91B84]
62M15   Spectral analysis
62M20   Prediction [See also 60G25]; filtering [See also 60G35, 93E10, 93E11]
62M30   Spatial processes
62M40   Random fields; image analysis
62M45   Neural nets and related approaches
62M99   None of the above, but in this section
62Nxx   **Survival analysis and censored data**
62N01   Censored data models
62N02   Estimation
62N03   Testing
62N05   Reliability and life testing [See also 90B25]
62N99   None of the above, but in this section
62Pxx   **Applications [See also 90–XX, 91–XX, 92–XX]**
62P05   Applications to actuarial sciences and financial mathematics
62P10   Applications to biology and medical sciences
62P12   Applications to environmental and related topics
62P15   Applications to psychology
62P20   Applications to economics [See also 91Bxx]
62P25   Applications to social sciences
62P30   Applications in engineering and industry
62P35   Applications to physics
62P99   None of the above, but in this section
62Q05   **Statistical tables**

65–XX   **NUMERICAL ANALYSIS**
65–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
65–01   Instructional exposition (textbooks, tutorial papers, etc.)
65–02   Research exposition (monographs, survey articles)
65–03   Historical (must also be assigned at least one classification number from Section 01)
65–04   Explicit machine computation and programs (not the theory of computation or programming)
65–05   Experimental papers
65–06   Proceedings, conferences, collections, etc.
65A05   **Tables**
65Bxx   **Acceleration of convergence**
65B05   Extrapolation to the limit, deferred corrections
65B10   Summation of series
65B15   Euler-Maclaurin formula
65B99   None of the above, but in this section
65Cxx   **Probabilistic methods, simulation and stochastic differential equations {For theoretical aspects, see 68U20 and 60H35}**
65C05   Monte Carlo methods
65C10   Random number generation
65C20   Models, numerical methods [See also 68U20]
65C30   Stochastic differential and integral equations

65C35   Stochastic particle methods [See also 82C80]

65C40   Computational Markov chains

65C50   Other computational problems in probability

65C60   Computational problems in statistics

65C99   None of the above, but in this section

65Dxx   **Numerical approximation and computational geometry (primarily algorithms) {For theory, see 41–XX and 68Uxx}**

65D05   Interpolation

65D07   Splines

65D10   Smoothing, curve fitting

65D15   Algorithms for functional approximation

65D17   Computer aided design (modeling of curves and surfaces) [See also 68U07]

65D18   Computer graphics and computational geometry [See also 51N05, 68U05]

65D20   Computation of special functions, construction of tables [See also 33F05]

65D25   Numerical differentiation

65D30   Numerical integration

65D32   Quadrature and cubature formulas

65D99   None of the above, but in this section

65E05   **Numerical methods in complex analysis (potential theory, etc.) {For numerical methods in conformal mapping, see 30C30}**

65Fxx   **Numerical linear algebra**

65F05   Direct methods for linear systems and matrix inversion

65F10   Iterative methods for linear systems [See also 65N22]

65F15   Eigenvalues, eigenvectors

65F18   Inverse eigenvalue problems

65F20   Overdetermined systems, pseudoinverses

65F22   Ill-posedness, regularization

65F25   Orthogonalization

65F30   Other matrix algorithms

65F35   Matrix norms, conditioning, scaling [See also 15A12, 15A60]

65F40   Determinants

65F50   Sparse matrices

65F99   None of the above, but in this section

65Gxx   **Error analysis and interval analysis**

65G20   Algorithms with automatic result verification

65G30   Interval and finite arithmetic

65G40   General methods in interval analysis

65G50   Roundoff error

65G99   None of the above, but in this section

65Hxx   **Nonlinear algebraic or transcendental equations**

65H05   Single equations

65H10   Systems of equations

65H17   Eigenvalues, eigenvectors [See also 47Hxx, 47Jxx, 58C40, 58E07, 90C30]

65H20   Global methods, including homotopy approaches [See also 58C30, 90C30]

65H99   None of the above, but in this section

65Jxx   **Numerical analysis in abstract spaces**

65J05   General theory

65J10   Equations with linear operators (do not use 65Fxx)

65J15   Equations with nonlinear operators (do not use 65Hxx)

65J20   Improperly posed problems; regularization

65J22   Inverse problems

65J99   None of the above, but in this section

65Kxx   **Mathematical programming, optimization and variational techniques**

65K05   Mathematical programming algorithms {For theory see 90Cxx}

65K10   Optimization and variational techniques [See also 49Mxx, 93B40]

65K99   None of the above, but in this section

65Lxx   **Ordinary differential equations**

65L05   Initial value problems

65L06   Multistep, Runge-Kutta and extrapolation methods

65L07   Numerical investigation of stability of solutions

65L08   Improperly posed problems

65L09   Inverse problems

65L10   Boundary value problems

65L12   Finite difference methods

65L15   Eigenvalue problems

65L20   Stability and convergence of numerical methods

65L50   Mesh generation and refinement

65L60   Finite elements, Rayleigh-Ritz, Galerkin and collocation methods

65L70   Error bounds

65L80   Methods for differential-algebraic equations

65L99   None of the above, but in this section

65Mxx   **Partial differential equations, initial value and time-dependent initial-boundary value problems**

65M06   Finite difference methods

65M12   Stability and convergence of numerical methods

65M15   Error bounds

65M20   Method of lines

65M25   Method of characteristics

65M30   Improperly posed problems

65M32   Inverse problems

65M50   Mesh generation and refinement

65M55   Multigrid methods; domain decomposition

65M60   Finite elements, Rayleigh-Ritz and Galerkin methods, finite methods

65M70   Spectral, collocation and related methods

65M99   None of the above, but in this section

65Nxx   **Partial differential equations, boundary value problems**

65N06   Finite difference methods

65N12   Stability and convergence of numerical methods

65N15   Error bounds

65N21   Inverse problems

65N22   Solution of discretized equations [See also 65Fxx, 65Hxx]

65N25   Eigenvalue problems

65N30	Finite elements, Rayleigh-Ritz and Galerkin methods, finite methods
65N35	Spectral, collocation and related methods
65N38	Boundary element methods
65N40	Method of lines
65N45	Method of contraction of the boundary
65N50	Mesh generation and refinement
65N55	Multigrid methods; domain decomposition
65N99	None of the above, but in this section

65Pxx **Numerical problems in dynamical systems [See also 37Mxx]**

65P10	Hamiltonian systems including symplectic integrators
65P20	Numerical chaos
65P30	Bifurcation problems
65P40	Nonlinear stabilities
65P99	None of the above, but in this section

65Q05 **Difference and functional equations, recurrence relations**

65Rxx **Integral equations, integral transforms**

65R10	Integral transforms
65R20	Integral equations
65R30	Improperly posed problems
65R32	Inverse problems
65R99	None of the above, but in this section

65S05 **Graphical methods**

65Txx **Numerical methods in Fourier analysis**

65T40	Trigonometric approximation and interpolation
65T50	Discrete and fast Fourier transforms
65T60	Wavelets
65T99	None of the above, but in this section

65Yxx **Computer aspects of numerical algorithms**

65Y05	Parallel computation
65Y10	Algorithms for specific classes of architectures
65Y15	Packaged methods
65Y20	Complexity and performance of numerical algorithms [See also 68Q25]
65Y99	None of the above, but in this section

65Z05 **Applications to physics**

68–XX **COMPUTER SCIENCE {For papers involving machine computations and programs in a specific mathematical area, see Section –04 in that area}**

68–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
68–01	Instructional exposition (textbooks, tutorial papers, etc.)
68–02	Research exposition (monographs, survey articles)
68–03	Historical (must also be assigned at least one classification number from Section 01)
68–04	Explicit machine computation and programs (not the theory of computation or programming)
68–06	Proceedings, conferences, collections, etc.

68Mxx **Computer system organization**

68M01	General
68M07	Mathematical problems of computer architecture
68M10	Network design and communication [See also 68R10, 90B18]
68M12	Network protocols
68M14	Distributed systems
68M15	Reliability, testing and fault tolerance [See also 94C12]
68M20	Performance evaluation; queueing; scheduling [See also 60K25, 90Bxx]
68M99	None of the above, but in this section

68Nxx **Software**

68N01	General
68N15	Programming languages
68N17	Logic programming
68N18	Functional programming and lambda calculus [See also 03B40]
68N19	Other programming techniques (object-oriented, sequential, concurrent, automatic, etc.)
68N20	Compilers and interpreters
68N25	Operating systems
68N30	Mathematical aspects of software engineering (specification, verification, metrics, requirements, etc.)
68N99	None of the above, but in this section

68Pxx **Theory of data**

68P01	General
68P05	Data structures
68P10	Searching and sorting
68P15	Database theory
68P20	Information storage and retrieval
68P25	Data encryption [See also 94A60, 81P68]
68P30	Coding and information theory (compaction, compression, models of communication, encoding schemes, etc.) [See also 94Axx]
68P99	None of the above, but in this section

68Qxx **Theory of computing**

68Q01	General
68Q05	Models of computation (Turing machines, etc.) [See also 03D10, 81P68]
68Q10	Modes of computation (nondeterministic, parallel, interactive, probabilistic, etc.) [See also 68Q85]
68Q15	Complexity classes (hierarchies, relations among complexity classes, etc.) [See also 03D15, 68Q17, 68Q19]
68Q17	Computational difficulty of problems (lower bounds, completeness, difficulty of approximation, etc.) [See also 68Q15]
68Q19	Descriptive complexity and finite models [See also 03C13]
68Q25	Analysis of algorithms and problem complexity [See also 68W40]
68Q30	Algorithmic information theory (Kolmogorov complexity, etc.)
68Q32	Computational learning theory [See also 68T05]
68Q42	Grammars and rewriting systems
68Q45	Formal languages and automata [See also 03D05, 68Q70, 94A45]
68Q55	Semantics [See also 03B70, 06B35, 18C50]

68Q60   Specification and verification (program logics, model checking, etc.) [See also 03B70]
68Q65   Abstract data types; algebraic specification [See also 18C50]
68Q70   Algebraic theory of languages and automata [See also 18B20, 20M35]
68Q80   Cellular automata [See also 37B15]
68Q85   Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.)
68Q99   None of the above, but in this section
68Rxx   Discrete mathematics in relation to computer science
68R01   General
68R05   Combinatorics
68R10   Graph theory [See also 05Cxx, 90B10, 90B35, 90C35]
68R15   Combinatorics on words
68R99   None of the above, but in this section
68Txx   Artificial intelligence
68T01   General
68T05   Learning and adaptive systems [See also 68Q32, 91E40]
68T10   Pattern recognition, speech recognition {For cluster analysis, see 62H30}
68T15   Theorem proving (deduction, resolution, etc.) [See also 03B35]
68T20   Problem solving (heuristics, search strategies, etc.)
68T27   Logic in artificial intelligence
68T30   Knowledge representation
68T35   Languages and software systems (knowledge-based systems, expert systems, etc.)
68T37   Reasoning under uncertainty
68T40   Robotics [See also 93C85]
68T45   Machine vision and scene understanding
68T50   Natural language processing [See also 03B65]
68T99   None of the above, but in this section
68Uxx   Computing methodologies and applications
68U01   General
68U05   Computer graphics; computational geometry [See also 65D18]
68U07   Computer-aided design [See also 65D17]
68U10   Image processing
68U15   Text processing; mathematical typography
68U20   Simulation [See also 65Cxx]
68U35   Information systems (hypertext navigation, interfaces, decision support, etc.)
68U99   None of the above, but in this section
68Wxx   Algorithms {For numerical algorithms, see 65–XX; for combinatorics and graph theory, see 68Rxx}
68W01   General
68W05   Nonnumerical algorithms
68W10   Parallel algorithms
68W15   Distributed algorithms
68W20   Randomized algorithms
68W25   Approximation algorithms

68W30   Symbolic computation and algebraic computation [See also 11Yxx, 12Y05, 13Pxx, 14Qxx, 16Z05, 17–08, 33F10]
68W35   VLSI algorithms
68W40   Analysis of algorithms [See also 68Q25]
68W99   None of the above, but in this section
70–XX   MECHANICS OF PARTICLES AND SYSTEMS {For relativistic mechanics, see 83A05 and 83C10; for statistical mechanics, see 82–XX}
70–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
70–01   Instructional exposition (textbooks, tutorial papers, etc.)
70–02   Research exposition (monographs, survey articles)
70–03   Historical (must also be assigned at least one classification number from Section 01)
70–04   Explicit machine computation and programs (not the theory of computation or programming)
70–05   Experimental work
70–06   Proceedings, conferences, collections, etc.
70–08   Computational methods
70A05   Axiomatics, foundations
70Bxx   Kinematics [See also 53A17]
70B05   Kinematics of a particle
70B10   Kinematics of a rigid body
70B15   Mechanisms, robots [See also 68T40, 70Q05, 93C85]
70B99   None of the above, but in this section
70C20   Statics
70Exx   Dynamics of a rigid body and of multibody systems
70E05   Motion of the gyroscope
70E15   Free motion of a rigid body [See also 70M20]
70E17   Motion of a rigid body with a fixed point
70E18   Motion of a rigid body in contact with a solid surface [See also 70F25]
70E20   Perturbation methods for rigid body dynamics
70E40   Integrable cases of motion
70E45   Higher-dimensional generalizations
70E50   Stability problems
70E55   Dynamics of multibody systems
70E60   Robot dynamics and control [See also 68T40, 70Q05, 93C85]
70E99   None of the above, but in this section
70Fxx   Dynamics of a system of particles, including celestial mechanics
70F05   Two-body problems
70F07   Three-body problems
70F10 n-body problems
70F15   Celestial mechanics
70F16   Collisions in celestial mechanics, regularization
70F17   Inverse problems
70F20   Holonomic systems
70F25   Nonholonomic systems
70F35   Collision of rigid or pseudo-rigid bodies
70F40   Problems with friction

70F45   Infinite particle systems
70F99   None of the above, but in this section
70Gxx   **General models, approaches, and methods [See also 37–XX]**
70G10   Generalized coordinates; event, impulse-energy, configuration, state, or phase space
70G40   Topological and differential-topological methods
70G45   Differential-geometric methods (tensors, connections, symplectic, Poisson, contact, Riemannian, nonholonomic, etc.) [See also 53Cxx, 53Dxx, 58Axx]
70G55   Algebraic geometry methods
70G60   Dynamical systems methods
70G65   Symmetries, Lie-group and Lie-algebra methods
70G70   Functional-analytic methods
70G75   Variational methods
70G99   None of the above, but in this section
70Hxx   **Hamiltonian and Lagrangian mechanics [See also 37Jxx]**
70H03   Lagrange's equations
70H05   Hamilton's equations
70H06   Completely integrable systems and methods of integration
70H07   Nonintegrable systems
70H08   Nearly integrable Hamiltonian systems, KAM theory
70H09   Perturbation theories
70H11   Adiabatic invariants
70H12   Periodic and almost periodic solutions
70H14   Stability problems
70H15   Canonical and symplectic transformations
70H20   Hamilton-Jacobi equations
70H25   Hamilton's principle
70H30   Other variational principles
70H33   Symmetries and conservation laws, reverse symmetries, invariant manifolds and their bifurcations, reduction
70H40   Relativistic dynamics
70H45   Constrained dynamics, Dirac's theory of constraints [See also 70F20, 70F25, 70Gxx]
70H50   Higher-order theories
70H99   None of the above, but in this section
70Jxx   **Linear vibration theory**
70J10   Modal analysis
70J25   Stability
70J30   Free motions
70J35   Forced motions
70J40   Parametric resonances
70J50   Systems arising from the discretization of structural vibration problems
70J99   None of the above, but in this section
70Kxx   **Nonlinear dynamics [See also 34Cxx, 37–XX]**
70K05   Phase plane analysis, limit cycles
70K20   Stability
70K25   Free motions
70K28   Parametric resonances
70K30   Nonlinear resonances
70K40   Forced motions

70K42   Equilibria and periodic trajectories
70K43   Quasi-periodic motions and invariant tori
70K44   Homoclinic and heteroclinic trajectories
70K45   Normal forms
70K50   Bifurcations and instability
70K55   Transition to stochasticity (chaotic behavior) [See also 37D45]
70K60   General perturbation schemes
70K65   Averaging of perturbations
70K70   Systems with slow and fast motions
70K75   Nonlinear modes
70K99   None of the above, but in this section
70L05   **Random vibrations [See also 74H50]**
70M20   **Orbital mechanics**
70P05   **Variable mass, rockets**
70Q05   **Control of mechanical systems [See also 49–XX, 93Cxx, 93Dxx]**
70Sxx   **Classical field theories [See also 37Kxx, 37Lxx, 78–XX, 81Txx, 83–XX]**
70S05   Lagrangian formalism and Hamiltonian formalism
70S10   Symmetries and conservation laws
70S15   Yang-Mills and other gauge theories
70S20   More general nonquantum field theories
70S99   None of the above, but in this section
74–XX   **MECHANICS OF DEFORMABLE SOLIDS**
74–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
74–01   Instructional exposition (textbooks, tutorial papers, etc.)
74–02   Research exposition (monographs, survey articles)
74–03   Historical (must also be assigned at least one classification number from Section 01)
74–04   Explicit machine computation and programs (not the theory of computation or programming)
74–05   Experimental work
74–06   Proceedings, conferences, collections, etc.
74Axx   **Generalities, axiomatics, foundations of continuum mechanics of solids**
74A05   Kinematics of deformation
74A10   Stress
74A15   Thermodynamics
74A20   Theory of constitutive functions
74A25   Molecular, statistical, and kinetic theories
74A30   Nonsimple materials
74A35   Polar materials
74A40   Random materials and composite materials
74A45   Theories of fracture and damage
74A50   Structured surfaces and interfaces, coexistent phases
74A55   Theories of friction (tribology)
74A60   Micromechanical theories
74A65   Reactive materials
74A99   None of the above, but in this section
74Bxx   **Elastic materials**
74B05   Classical linear elasticity
74B10   Linear elasticity with initial stresses

74B15   Equations linearized about a deformed state (small deformations superposed on large)
74B20   Nonlinear elasticity
74B99   None of the above, but in this section
74Cxx   **Plastic materials, materials of stress-rate and internal-variable type**
74C05   Small-strain, rate-independent theories (including rigid-plastic and elasto-plastic materials)
74C10   Small-strain, rate-dependent theories (including theories of viscoplasticity)
74C15   Large-strain, rate-independent theories (including nonlinear plasticity)
74C20   Large-strain, rate-dependent theories
74C99   None of the above, but in this section
74Dxx   **Materials of strain-rate type and history type, other materials with memory (including elastic materials with viscous damping, various viscoelastic materials)**
74D05   Linear constitutive equations
74D10   Nonlinear constitutive equations
74D99   None of the above, but in this section
74Exx   **Material properties given special treatment**
74E05   Inhomogeneity
74E10   Anisotropy
74E15   Crystalline structure
74E20   Granularity
74E25   Texture
74E30   Composite and mixture properties
74E35   Random structure
74E40   Chemical structure
74E99   None of the above, but in this section
74Fxx   **Coupling of solid mechanics with other effects**
74F05   Thermal effects
74F10   Fluid-solid interactions (including aero- and hydro-elasticity, porosity, etc.)
74F15   Electromagnetic effects
74F20   Mixture effects
74F25   Chemical and reactive effects
74F99   None of the above, but in this section
74Gxx   **Equilibrium (steady-state) problems**
74G05   Explicit solutions
74G10   Analytic approximation of solutions (perturbation methods, asymptotic methods, series, etc.)
74G15   Numerical approximation of solutions
74G20   Local existence of solutions (near a given solution)
74G25   Global existence of solutions
74G30   Uniqueness of solutions
74G35   Multiplicity of solutions
74G40   Regularity of solutions
74G45   Bounds for solutions
74G50   Saint-Venant's principle
74G55   Qualitative behavior of solutions
74G60   Bifurcation and buckling
74G65   Energy minimization
74G70   Stress concentrations, singularities
74G75   Inverse problems
74G99   None of the above, but in this section

74Hxx   **Dynamical problems**
74H05   Explicit solutions
74H10   Analytic approximation of solutions (perturbation methods, asymptotic methods, series, etc.)
74H15   Numerical approximation of solutions
74H20   Existence of solutions
74H25   Uniqueness of solutions
74H30   Regularity of solutions
74H35   Singularities, blowup, stress concentrations
74H40   Long-time behavior of solutions
74H45   Vibrations
74H50   Random vibrations
74H55   Stability
74H60   Dynamical bifurcation
74H65   Chaotic behavior
74H99   None of the above, but in this section
74Jxx   **Waves**
74J05   Linear waves
74J10   Bulk waves
74J15   Surface waves
74J20   Wave scattering
74J25   Inverse problems
74J30   Nonlinear waves
74J35   Solitary waves
74J40   Shocks and related discontinuities
74J99   None of the above, but in this section
74Kxx   **Thin bodies, structures**
74K05   Strings
74K10   Rods (beams, columns, shafts, arches, rings, etc.)
74K15   Membranes
74K20   Plates
74K25   Shells
74K30   Junctions
74K35   Thin films
74K99   None of the above, but in this section
74Lxx   **Special subfields of solid mechanics**
74L05   Geophysical solid mechanics [See also 86–XX]
74L10   Soil and rock mechanics
74L15   Biomechanical solid mechanics [See also 92C10]
74L99   None of the above, but in this section
74Mxx   **Special kinds of problems**
74M05   Control, switches and devices ("smart materials") [See also 93Cxx]
74M10   Friction
74M15   Contact
74M20   Impact
74M25   Micromechanics
74M99   None of the above, but in this section
74Nxx   **Phase transformations in solids [See also 74A50, 80Axx, 82B26, 82C26]**
74N05   Crystals
74N10   Displacive transformations
74N15   Analysis of microstructure
74N20   Dynamics of phase boundaries
74N25   Transformations involving diffusion
74N30   Problems involving hysteresis
74N99   None of the above, but in this section

74Pxx **Optimization [See also 49Qxx]**
74P05 Compliance or weight optimization
74P10 Optimization of other properties
74P15 Topological methods
74P20 Geometrical methods
74P99 None of the above, but in this section
74Qxx **Homogenization, determination of effective properties**
74Q05 Homogenization in equilibrium problems
74Q10 Homogenization and oscillations in dynamical problems
74Q15 Effective constitutive equations
74Q20 Bounds on effective properties
74Q99 None of the above, but in this section
74Rxx **Fracture and damage**
74R05 Brittle damage
74R10 Brittle fracture
74R15 High-velocity fracture
74R20 Anelastic fracture and damage
74R99 None of the above, but in this section
74Sxx **Numerical methods [See also 65–XX, 74G15, 74H15]**
74S05 Finite element methods
74S10 Finite volume methods
74S15 Boundary element methods
74S20 Finite difference methods
74S25 Spectral and related methods
74S30 Other numerical methods
74S99 None of the above, but in this section
76–XX **FLUID MECHANICS {For general continuum mechanics, see 74Axx, or other parts of 74-XX}**
76–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
76–01 Instructional exposition (textbooks, tutorial papers, etc.)
76–02 Research exposition (monographs, survey articles)
76–03 Historical (must also be assigned at least one classification number from Section 01)
76–04 Explicit machine computation and programs (not the theory of computation or programming)
76–05 Experimental work
76–06 Proceedings, conferences, collections, etc.
76Axx **Foundations, constitutive equations, rheology**
76A02 Foundations of fluid mechanics
76A05 Non-Newtonian fluids
76A10 Viscoelastic fluids
76A15 Liquid crystals [See also 82D30]
76A20 Thin fluid films
76A25 Superfluids (classical aspects)
76A99 None of the above, but in this section
76Bxx **Incompressible inviscid fluids**
76B03 Existence, uniqueness, and regularity theory [See also 35Q35]
76B07 Free-surface potential flows

76B10 Jets and cavities, cavitation, free-streamline theory, water-entry problems, airfoil and hydrofoil theory, sloshing
76B15 Water waves, gravity waves; dispersion and scattering, nonlinear interaction [See also 35Q30, 35Q53]
76B20 Ship waves
76B25 Solitary waves [See also 35Q51]
76B45 Capillarity (surface tension) [See also 76D45]
76B47 Vortex flows
76B55 Internal waves
76B60 Atmospheric waves [See also 86A10]
76B65 Rossby waves [See also 86A05, 86A10]
76B70 Stratification effects in inviscid fluids
76B75 Flow control and optimization [See also 49Q10, 93C20, 93C95]
76B99 None of the above, but in this section
76Dxx **Incompressible viscous fluids**
76D03 Existence, uniqueness, and regularity theory [See also 35Q30, 35Q35]
76D05 Navier-Stokes equations [See also 35Q30]
76D06 Statistical solutions of Navier-Stokes and related equations [See also 60H30, 76M35]
76D07 Stokes and related (Oseen, etc.) flows
76D08 Lubrication theory
76D09 Viscous-inviscid interaction
76D10 Boundary-layer theory, separation and reattachment, higher-order effects
76D17 Viscous vortex flows
76D25 Wakes and jets
76D27 Other free-boundary flows; Hele-Shaw flows
76D33 Waves
76D45 Capillarity (surface tension) [See also 76B45]
76D50 Stratification effects in viscous fluids
76D55 Flow control and optimization [See also 49Q10, 93C20, 93C95]
76D99 None of the above, but in this section
76Exx **Hydrodynamic stability**
76E05 Parallel shear flows
76E06 Convection
76E07 Rotation
76E09 Stability and instability of nonparallel flows
76E15 Absolute and convective instability and stability
76E17 Interfacial stability and instability
76E19 Compressibility effects
76E20 Stability and instability of geophysical and astrophysical flows
76E25 Stability and instability of magnetohydrodynamic and electrohydrodynamic flows
76E30 Nonlinear effects
76E99 None of the above, but in this section
76Fxx **Turbulence [See also 37–XX, 60Gxx, 60Jxx]**
76F02 Fundamentals
76F05 Isotropic turbulence; homogeneous turbulence
76F06 Transition to turbulence
76F10 Shear flows
76F20 Dynamical systems approach to turbulence [See also 37–XX]

76F25	Turbulent transport, mixing
76F30	Renormalization and other field-theoretical methods [See also 81T99]
76F35	Convective turbulence [See also 76E15, 76Rxx]
76F40	Turbulent boundary layers
76F45	Stratification effects
76F50	Compressibility effects
76F55	Statistical turbulence modeling [See also 76M35]
76F60	k-ε modeling
76F65	Direct numerical and large eddy simulation of turbulence
76F70	Control of turbulent flows
76F99	None of the above, but in this section
76G25	**General aerodynamics and subsonic flows**
76H05	**Transonic flows**
76J20	**Supersonic flows**
76K05	**Hypersonic flows**
76L05	**Shock waves and blast waves [See also 35L67]**
76Mxx	**Basic methods in fluid mechanics [See also 65–XX]**
76M10	Finite element methods
76M12	Finite volume methods
76M15	Boundary element methods
76M20	Finite difference methods
76M22	Spectral methods
76M23	Vortex methods
76M25	Other numerical methods
76M27	Visualization algorithms
76M28	Particle methods and lattice-gas methods
76M30	Variational methods
76M35	Stochastic analysis
76M40	Complex-variables methods
76M45	Asymptotic methods, singular perturbations
76M50	Homogenization
76M55	Dimensional analysis and similarity
76M60	Symmetry analysis, Lie group and algebra methods
76M99	None of the above, but in this section
76Nxx	**Compressible fluids and gas dynamics, general**
76N10	Existence, uniqueness, and regularity theory [See also 35L60, 35L65, 35Q30]
76N15	Gas dynamics, general
76N17	Viscous-inviscid interaction
76N20	Boundary-layer theory
76N25	Flow control and optimization
76N99	None of the above, but in this section
76P05	**Rarefied gas flows, Boltzmann equation [See also 82B40, 82C40, 82D05]**
76Q05	**Hydro- and aero-acoustics**
76Rxx	**Diffusion and convection**
76R05	Forced convection
76R10	Free convection
76R50	Diffusion [See also 60J60]
76R99	None of the above, but in this section
76S05	**Flows in porous media; filtration; seepage**

76Txx	**Two-phase and multiphase flows**
76T10	Liquid-gas two-phase flows, bubbly flows
76T15	Dusty-gas two-phase flows
76T20	Suspensions
76T25	Granular flows [See also 74C99, 74E20]
76T30	Three or more component flows
76T99	None of the above, but in this section
76U05	**Rotating fluids**
76V05	**Reaction effects in flows [See also 80A32]**
76W05	**Magnetohydrodynamics and electrohydrodynamics**
76X05	**Ionized gas flow in electromagnetic fields; plasmic flow [See also 82D10]**
76Y05	**Quantum hydrodynamics and relativistic hydrodynamics [See also 83C55, 85A30]**
76Zxx	**Biological fluid mechanics [See also 74F10, 74L15, 92Cxx]**
76Z05	Physiological flows [See also 92C35]
76Z10	Biopropulsion in water and in air
76Z99	None of the above, but in this section
78–XX	**OPTICS, ELECTROMAGNETIC THEORY {For quantum optics, see 81V80}**
78–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
78–01	Instructional exposition (textbooks, tutorial papers, etc.)
78–02	Research exposition (monographs, survey articles)
78–03	Historical (must also be assigned at least one classification number from Section 01)
78–04	Explicit machine computation and programs (not the theory of computation or programming)
78–05	Experimental work
78–06	Proceedings, conferences, collections, etc.
78Axx	**General**
78A02	Foundations
78A05	Geometric optics
78A10	Physical optics
78A15	Electron optics
78A20	Space charge waves
78A25	Electromagnetic theory, general
78A30	Electro- and magnetostatics
78A35	Motion of charged particles
78A40	Waves and radiation
78A45	Diffraction, scattering [See also 34E20 for WKB methods]
78A46	Inverse scattering problems
78A48	Composite media; random media
78A50	Antennas, wave-guides
78A55	Technical applications
78A60	Lasers, masers, optical bistability, nonlinear optics [See also 81V80]
78A70	Biological applications [See also 91D30, 92C30]
78A97	Mathematically heuristic optics and electromagnetic theory (must also be assigned at least one other classification number in this section)
78A99	Miscellaneous topics

78Mxx **Basic methods**
78M05 Method of moments
78M10 Finite element methods
78M15 Boundary element methods
78M20 Finite difference methods
78M25 Other numerical methods
78M30 Variational methods
78M35 Asymptotic analysis
78M40 Homogenization
78M50 Optimization
78M99 None of the above, but in this section

80–XX **CLASSICAL THERMODYNAMICS, HEAT TRANSFER** {**For thermodynamics of solids, see 74A15**}
80–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
80–01 Instructional exposition (textbooks, tutorial papers, etc.)
80–02 Research exposition (monographs, survey articles)
80–03 Historical (must also be assigned at least one classification number from Section 01)
80–04 Explicit machine computation and programs (not the theory of computation or programming)
80–05 Experimental work
80–06 Proceedings, conferences, collections, etc.
80Axx **Thermodynamics and heat transfer**
80A05 Foundations
80A10 Classical thermodynamics, including relativistic
80A17 Thermodynamics of continua [See also 74A15]
80A20 Heat and mass transfer, heat flow
80A22 Stefan problems, phase changes, etc. [See also 74Nxx]
80A23 Inverse problems
80A25 Combustion
80A30 Chemical kinetics [See also 76V05, 92C45, 92E20]
80A32 Chemically reacting flows [See also 92C45, 92E20]
80A50 Chemistry (general) [See mainly 92Exx]
80A99 None of the above, but in this section
80Mxx **Basic methods**
80M10 Finite element methods
80M15 Boundary element methods
80M20 Finite difference methods
80M25 Other numerical methods
80M30 Variational methods
80M35 Asymptotic analysis
80M40 Homogenization
80M50 Optimization
80M99 None of the above, but in this section

81–XX **QUANTUM THEORY**
81–00 General reference works (handbooks, dictionaries, bibliographies, etc.)
81–01 Instructional exposition (textbooks, tutorial papers, etc.)
81–02 Research exposition (monographs, survey articles)

81–03 Historical (must also be assigned at least one classification number from Section 01)
81–04 Explicit machine computation and programs (not the theory of computation or programming)
81–05 Experimental papers
81–06 Proceedings, conferences, collections, etc.
81–08 Computational methods
81Pxx **Axiomatics, foundations, philosophy**
81P05 General and philosophical
81P10 Logical foundations of quantum mechanics; quantum logic [See also 03G12, 06C15]
81P15 Quantum measurement theory
81P20 Stochastic mechanics (including stochastic electrodynamics)
81P68 Quantum computation and quantum cryptography [See also 68Q05, 94A60]
81P99 None of the above, but in this section
81Qxx **General mathematical topics and methods in quantum theory**
81Q05 Closed and approximate solutions to the Schrödinger, Dirac, Klein-Gordon and other quantum-mechanical equations
81Q10 Selfadjoint operator theory in quantum theory, including spectral analysis
81Q15 Perturbation theories for operators and differential equations
81Q20 Semiclassical techniques including WKB and Maslov methods
81Q30 Feynman integrals and graphs; applications of algebraic topology and algebraic geometry [See also 14D05, 32S40]
81Q40 Bethe-Salpeter and other integral equations
81Q50 Quantum chaos [See also 37Dxx]
81Q60 Supersymmetric quantum mechanics
81Q70 Differential-geometric methods, including holonomy, Berry and Hannay phases, etc.
81Q99 None of the above, but in this section
81Rxx **Groups and algebras in quantum theory**
81R05 Finite-dimensional groups and algebras motivated by physics and their representations [See also 20C35, 22E70]
81R10 Infinite-dimensional groups and algebras motivated by physics, including Virasoro, Kac-Moody, W-algebras and other current algebras and their representations [See also 17B65, 17B67, 22E65, 22E67, 22E70]
81R12 Relations with integrable systems [See also 17Bxx, 37J35]
81R15 Operator algebra methods [See also 46Lxx, 81T05]
81R20 Covariant wave equations
81R25 Spinor and twistor methods [See also 32L25]
81R30 Coherent states [See also 22E45]; squeezed states [See also 81V80]
81R40 Symmetry breaking
81R50 Quantum groups and related algebraic methods [See also 16W35, 17B37]
81R60 Noncommutative geometry

81R99 None of the above, but in this section

81Sxx **General quantum mechanics and problems of quantization**

81S05 Commutation relations and statistics

81S10 Geometry and quantization, symplectic methods [See also 53D50]

81S20 Stochastic quantization

81S25 Quantum stochastic calculus

81S30 Phase space methods including Wigner distributions, etc.

81S40 Path integrals [See also 58D30]

81S99 None of the above, but in this section

81Txx **Quantum field theory; related classical field theories [See also 70Sxx]**

81T05 Axiomatic quantum field theory; operator algebras

81T08 Constructive quantum field theory

81T10 Model quantum field theories

81T13 Yang-Mills and other gauge theories [See also 53C07, 58E15]

81T15 Perturbative methods of renormalization

81T16 Nonperturbative methods of renormalization

81T17 Renormalization group methods

81T18 Feynman diagrams

81T20 Quantum field theory on curved space backgrounds

81T25 Quantum field theory on lattices

81T27 Continuum limits

81T30 String and superstring theories; other extended objects (e.g., branes) [See also 83E30]

81T40 Two-dimensional field theories, conformal field theories, etc.

81T45 Topological field theories [See also 57R56, 58Dxx]

81T50 Anomalies

81T60 Supersymmetric field theories

81T70 Quantization in field theory; cohomological methods [See also 58D29]

81T75 Noncommutative geometry methods [See also 46L85, 46L87, 58B34]

81T80 Simulation and numerical modeling

81T99 None of the above, but in this section

81Uxx **Scattering theory [See also 34A55, 34L25, 34L40, 35P25, 47A40]**

81U05 2-body potential scattering theory [See also 34E20 for WKB methods]

81U10 n-body potential scattering theory

81U15 Exactly and quasi-solvable systems

81U20 S-matrix theory, etc.

81U30 Dispersion theory, dispersion relations

81U40 Inverse scattering problems

81U99 None of the above, but in this section

81Vxx **Applications to specific physical systems**

81V05 Strong interaction, including quantum chromodynamics

81V10 Electromagnetic interaction; quantum electrodynamics

81V15 Weak interaction

81V17 Gravitational interaction [See also 83Cxx and 83Exx]

81V19 Other fundamental interactions

81V22 Unified theories

81V25 Other elementary particle theory

81V35 Nuclear physics

81V45 Atomic physics

81V55 Molecular physics [See also 92E10]

81V70 Many-body theory; quantum Hall effect

81V80 Quantum optics

81V99 None of the above, but in this section

82–XX **STATISTICAL MECHANICS, STRUCTURE OF MATTER**

82–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

82–01 Instructional exposition (textbooks, tutorial papers, etc.)

82–02 Research exposition (monographs, survey articles)

82–03 Historical (must also be assigned at least one classification number from Section 01)

82–04 Explicit machine computation and programs (not the theory of computation or programming)

82–05 Experimental papers

82–06 Proceedings, conferences, collections, etc.

82–08 Computational methods

82Bxx **Equilibrium statistical mechanics**

82B03 Foundations

82B05 Classical equilibrium statistical mechanics (general)

82B10 Quantum equilibrium statistical mechanics (general)

82B20 Lattice systems (Ising, dimer, Potts, etc.) and systems on graphs

82B21 Continuum models (systems of particles, etc.)

82B23 Exactly solvable models; Bethe ansatz

82B24 Interface problems; diffusion-limited aggregation

82B26 Phase transitions (general)

82B27 Critical phenomena

82B28 Renormalization group methods [See also 81T17]

82B30 Statistical thermodynamics [See also 80–XX]

82B31 Stochastic methods

82B35 Irreversible thermodynamics, including Onsager-Machlup theory [See also 92E20]

82B40 Kinetic theory of gases

82B41 Random walks, random surfaces, lattice animals, etc. [See also 60G50, 82C41]

82B43 Percolation [See also 60K35]

82B44 Disordered systems (random Ising models, random Schrödinger operators, etc.)

82B80 Numerical methods (Monte Carlo, series resummation, etc.) [See also 65–XX, 81T80]

82B99 None of the above, but in this section

82Cxx **Time-dependent statistical mechanics (dynamic and nonequilibrium)**

82C03 Foundations

82C05 Classical dynamic and nonequilibrium statistical mechanics (general)

82C10 Quantum dynamics and nonequilibrium statistical mechanics (general)

82C20 Dynamic lattice systems (kinetic Ising, etc.) and systems on graphs

82C21 Dynamic continuum models (systems of particles, etc.)

82C22 Interacting particle systems [See also 60K35]

82C23 Exactly solvable dynamic models [See also 37K60]

82C24 Interface problems; diffusion-limited aggregation

82C26 Dynamic and nonequilibrium phase transitions (general)

82C27 Dynamic critical phenomena

82C28 Dynamic renormalization group methods [See also 81T17]

82C31 Stochastic methods (Fokker-Planck, Langevin, etc.) [See also 60H10]

82C32 Neural nets [See also 68T05, 91E40, 92B20]

82C35 Irreversible thermodynamics, including Onsager-Machlup theory

82C40 Kinetic theory of gases

82C41 Dynamics of random walks, random surfaces, lattice animals, etc. [See also 60G50]

82C43 Time-dependent percolation [See also 60K35]

82C44 Dynamics of disordered systems (random Ising systems, etc.)

82C70 Transport processes

82C80 Numerical methods (Monte Carlo, series resummation, etc.)

82C99 None of the above, but in this section

82Dxx **Applications to specific types of physical systems**

82D05 Gases

82D10 Plasmas

82D15 Liquids

82D20 Solids

82D25 Crystals {For crystallographic group theory, see 20H15}

82D30 Random media, disordered materials (including liquid crystals and spin glasses)

82D35 Metals

82D37 Semiconductors

82D40 Magnetic materials

82D45 Ferroelectrics

82D50 Superfluids

82D55 Superconductors

82D60 Polymers

82D75 Nuclear reactor theory; neutron transport

82D99 None of the above, but in this section

83–XX **RELATIVITY AND GRAVITATIONAL THEORY**

83–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

83–01 Instructional exposition (textbooks, tutorial papers, etc.)

83–02 Research exposition (monographs, survey articles)

83–03 Historical (must also be assigned at least one classification number from Section 01)

83–04 Explicit machine computation and programs (not the theory of computation or programming)

83–05 Experimental work

83–06 Proceedings, conferences, collections, etc.

83–08 Computational methods

83A05 **Special relativity**

83B05 **Observational and experimental questions**

83Cxx **General relativity**

83C05 Einstein's equations (general structure, canonical formalism, Cauchy problems)

83C10 Equations of motion

83C15 Exact solutions

83C20 Classes of solutions; algebraically special solutions, metrics with symmetries

83C22 Einstein-Maxwell equations

83C25 Approximation procedures, weak fields

83C27 Lattice gravity, Regge calculus and other discrete methods

83C30 Asymptotic procedures (radiation, news functions, $\mathcal{H}$-spaces, etc.)

83C35 Gravitational waves

83C40 Gravitational energy and conservation laws; groups of motions

83C45 Quantization of the gravitational field

83C47 Methods of quantum field theory [See also 81T20]

83C50 Electromagnetic fields

83C55 Macroscopic interaction of the gravitational field with matter (hydrodynamics, etc.)

83C57 Black holes

83C60 Spinor and twistor methods; Newman-Penrose formalism

83C65 Methods of noncommutative geometry [See also 58B34]

83C75 Space-time singularities, cosmic censorship, etc.

83C80 Analogues in lower dimensions

83C99 None of the above, but in this section

83D05 **Relativistic gravitational theories other than Einstein's, including asymmetric field theories**

83Exx **Unified, higher-dimensional and super field theories**

83E05 Geometrodynamics

83E15 Kaluza-Klein and other higher-dimensional theories

83E30 String and superstring theories [See also 81T30]

83E50 Supergravity

83E99 None of the above, but in this section

83F05 **Cosmology**

85–XX **ASTRONOMY AND ASTROPHYSICS {For celestial mechanics, see 70F15}**

85–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

85–01 Instructional exposition (textbooks, tutorial papers, etc.)

85–02 Research exposition (monographs, survey articles)

85–03	Historical (must also be assigned at least one classification number from Section 01)
85–04	Explicit machine computation and programs (not the theory of computation or programming)
85–05	Experimental work
85–06	Proceedings, conferences, collections, etc.
85–08	Computational methods
85A04	General
85A05	Galactic and stellar dynamics
85A15	Galactic and stellar structure
85A20	Planetary atmospheres
85A25	Radiative transfer
85A30	Hydrodynamic and hydromagnetic problems [See also 76Y05]
85A35	Statistical astronomy
85A40	Cosmology {For relativistic cosmology, see 83F05}
85A99	Miscellaneous topics
86–XX	**GEOPHYSICS [See also 76U05, 76V05]**
86–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
86–01	Instructional exposition (textbooks, tutorial papers, etc.)
86–02	Research exposition (monographs, survey articles)
86–03	Historical (must also be assigned at least one classification number from Section 01)
86–04	Explicit machine computation and programs (not the theory of computation or programming)
86–05	Experimental work
86–06	Proceedings, conferences, collections, etc.
86–08	Computational methods
86A04	General
86A05	Hydrology, hydrography, oceanography [See also 76Bxx, 76E20, 76Q05, 76Rxx, 76U05]
86A10	Meteorology and atmospheric physics [See also 76Bxx, 76E20, 76N15, 76Q05, 76Rxx, 76U05]
86A15	Seismology
86A17	Global dynamics, earthquake problems
86A20	Potentials, prospecting
86A22	Inverse problems [See also 35R30]
86A25	Geo-electricity and geomagnetism [See also 76W05, 78A25]
86A30	Geodesy, mapping problems
86A32	Geostatistics
86A40	Glaciology
86A60	Geological problems
86A99	Miscellaneous topics
90–XX	**OPERATIONS RESEARCH, MATHEMATICAL PROGRAMMING**
90–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
90–01	Instructional exposition (textbooks, tutorial papers, etc.)
90–02	Research exposition (monographs, survey articles)
90–03	Historical (must also be assigned at least one classification number from Section 01)

90–04	Explicit machine computation and programs (not the theory of computation or programming)
90–06	Proceedings, conferences, collections, etc.
90–08	Computational methods
90Bxx	**Operations research and management science**
90B05	Inventory, storage, reservoirs
90B06	Transportation, logistics
90B10	Network models, deterministic
90B15	Network models, stochastic
90B18	Communication networks [See also 68M10, 94A05]
90B20	Traffic problems
90B22	Queues and service [See also 60K25, 68M20]
90B25	Reliability, availability, maintenance, inspection [See also 60K10, 62N05]
90B30	Production models
90B35	Scheduling theory, deterministic [See also 68M20]
90B36	Scheduling theory, stochastic [See also 68M20]
90B40	Search theory
90B50	Management decision making, including multiple objectives [See also 90C31, 91A35, 91B06]
90B60	Marketing, advertising [See also 91B60]
90B70	Theory of organizations, manpower planning [See also 91D35]
90B80	Discrete location and assignment [See also 90C10]
90B85	Continuous location
90B90	Case-oriented studies
90B99	None of the above, but in this section
90Cxx	**Mathematical programming [See also 49Mxx, 65Kxx]**
90C05	Linear programming
90C06	Large-scale problems
90C08	Special problems of linear programming (transportation, multi-index, etc.)
90C09	Boolean programming
90C10	Integer programming
90C11	Mixed integer programming
90C15	Stochastic programming
90C20	Quadratic programming
90C22	Semidefinite programming
90C25	Convex programming
90C26	Nonconvex programming
90C27	Combinatorial optimization
90C29	Multi-objective and goal programming
90C30	Nonlinear programming
90C31	Sensitivity, stability, parametric optimization
90C32	Fractional programming
90C33	Complementarity problems
90C34	Semi-infinite programming
90C35	Programming involving graphs or networks [See also 90C27]
90C39	Dynamic programming [See also 49L20]
90C40	Markov and semi-Markov decision processes
90C46	Optimality conditions, duality [See also 49N15]
90C47	Minimax problems [See also 49K35]
90C48	Programming in abstract spaces

90C49	Extreme-point and pivoting methods
90C51	Interior-point methods
90C52	Methods of reduced gradient type
90C53	Methods of quasi-Newton type
90C55	Methods of successive quadratic programming type
90C56	Derivative-free methods
90C57	Polyhedral combinatorics, branch-and-bound, branch-and-cut
90C59	Approximation methods and heuristics
90C60	Abstract computational complexity for mathematical programming problems [See also 68Q25]
90C70	Fuzzy programming
90C90	Applications of mathematical programming
90C99	None of the above, but in this section

91–XX GAME THEORY, ECONOMICS, SOCIAL AND BEHAVIORAL SCIENCES

91–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
91–01	Instructional exposition (textbooks, tutorial papers, etc.)
91–02	Research exposition (monographs, survey articles)
91–03	Historical (must also be assigned at least one classification number from section 01)
91–04	Explicit machine computation and programs (not the theory of computation or programming)
91–06	Proceedings, conferences, collections, etc.
91–08	Computational methods

91Axx Game theory

91A05	2-person games
91A06	n-person games, $n > 2$
91A10	Noncooperative games
91A12	Cooperative games
91A13	Games with infinitely many players
91A15	Stochastic games
91A18	Games in extensive form
91A20	Multistage and repeated games
91A22	Evolutionary games
91A23	Differential games [See also 49N70]
91A24	Positional games (pursuit and evasion, etc.) [See also 49N75]
91A25	Dynamic games
91A26	Rationality, learning
91A28	Signaling, communication
91A30	Utility theory for games [See also 91B16]
91A35	Decision theory for games [See also 62Cxx, 91B06, 90B50]
91A40	Game-theoretic models
91A43	Games involving graphs
91A44	Games involving topology or set theory
91A46	Combinatorial games
91A50	Discrete-time games
91A55	Games of timing
91A60	Probabilistic games; gambling
91A65	Hierarchical games
91A70	Spaces of games

91A80	Applications of game theory
91A90	Experimental studies
91A99	None of the above, but in this section

91Bxx Mathematical economics {For econometrics, see 62P20}

91B02	Fundamental topics (basic mathematics, methodology; applicable to economics in general)
91B06	Decision theory [See also 62Cxx, 90B50, 91A35]
91B08	Individual preferences
91B10	Group preferences
91B12	Voting theory
91B14	Social choice
91B16	Utility theory
91B18	Public goods
91B24	Price theory and market structure
91B26	Market models (auctions, bargaining, bidding, selling, etc.)
91B28	Finance, portfolios, investment
91B30	Risk theory, insurance
91B32	Resource and cost allocation
91B38	Production theory, theory of the firm
91B40	Labor market, contracts
91B42	Consumer behavior, demand theory
91B44	Informational economics
91B50	Equilibrium: general theory
91B52	Special types of equilibria
91B54	Special types of economies
91B60	General economic models, trade models
91B62	Dynamic economic models, growth models
91B64	Macro-economic models (monetary models, models of taxation)
91B66	Multisectoral models
91B68	Matching models
91B70	Stochastic models
91B72	Spatial models
91B74	Models of real-world systems
91B76	Environmental economics (natural resource models, harvesting, pollution, etc.)
91B82	Statistical methods; economic indices and measures
91B84	Economic time series analysis [See also 62M10]
91B99	None of the above, but in this section

91Cxx Social and behavioral sciences: general topics {For statistics, see 62–XX}

91C05	Measurement theory
91C15	One- and multidimensional scaling
91C20	Clustering [See also 62D05]
91C99	None of the above, but in this section

91Dxx Mathematical sociology (including anthropology)

91D10	Models of societies, social and urban evolution
91D20	Mathematical geography and demography
91D25	Spatial models [See also 91B72]
91D30	Social networks
91D35	Manpower systems [See also 91B40, 90B70]
91D99	None of the above, but in this section

91Exx   Mathematical psychology
91E10   Cognitive psychology
91E30   Psychophysics and psychophysiology; perception
91E40   Memory and learning [See also 68T05]
91E45   Measurement and performance
91E99   None of the above, but in this section
91Fxx   Other social and behavioral sciences (mathematical treatment)
91F10   History, political science
91F20   Linguistics [See also 03B65, 68T50]
91F99   None of the above, but in this section
92–XX   BIOLOGY AND OTHER NATURAL SCIENCES
92–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
92–01   Instructional exposition (textbooks, tutorial papers, etc.)
92–02   Research exposition (monographs, survey articles)
92–03   Historical (must also be assigned at least one classification number from Section 01)
92–04   Explicit machine computation and programs (not the theory of computation or programming)
92–06   Proceedings, conferences, collections, etc.
92–08   Computational methods
92Bxx   Mathematical biology in general
92B05   General biology and biomathematics
92B10   Taxonomy, statistics
92B15   General biostatistics [See also 62P10]
92B20   Neural networks, artificial life and related topics [See also 68T05, 82C32, 94Cxx]
92B99   None of the above, but in this section
92Cxx   Physiological, cellular and medical topics
92C05   Biophysics
92C10   Biomechanics [See also 74L15]
92C15   Developmental biology, pattern formation
92C17   Cell movement (chemotaxis, etc.)
92C20   Neural biology
92C30   Physiology (general)
92C35   Physiological flow [See also 76Z05]
92C37   Cell biology
92C40   Biochemistry, molecular biology
92C45   Kinetics in biochemical problems (pharmacokinetics, enzyme kinetics, etc.) [See also 80A30]
92C50   Medical applications (general)
92C55   Biomedical imaging and signal processing [See also 44A12, 65R10]
92C60   Medical epidemiology
92C80   Plant biology
92C99   None of the above, but in this section
92Dxx   Genetics and population dynamics
92D10   Genetics {For genetic algebras, see 17D92}
92D15   Problems related to evolution
92D20   Protein sequences, DNA sequences
92D25   Population dynamics (general)
92D30   Epidemiology
92D40   Ecology

92D50   Animal behavior
92D99   None of the above, but in this section
92Exx   Chemistry {For biochemistry, see 92C40}
92E10   Molecular structure (graph-theoretic methods, methods of differential topology, etc.)
92E20   Classical flows, reactions, etc. [See also 80A30, 80A32]
92E99   None of the above, but in this section
92F05   Other natural sciences

93–XX   SYSTEMS THEORY; CONTROL {For optimal control, see 49–XX}
93–00   General reference works (handbooks, dictionaries, bibliographies, etc.)
93–01   Instructional exposition (textbooks, tutorial papers, etc.)
93–02   Research exposition (monographs, survey articles)
93–03   Historical (must also be assigned at least one classification number from Section 01)
93–04   Explicit machine computation and programs (not the theory of computation or programming)
93–06   Proceedings, conferences, collections, etc.
93Axx   General
93A05   Axiomatic system theory
93A10   General systems
93A13   Hierarchical systems
93A14   Decentralized systems
93A15   Large scale systems
93A30   Mathematical modeling (models of systems, model-matching, etc.)
93A99   None of the above, but in this section
93Bxx   Controllability, observability, and system structure
93B03   Attainable sets
93B05   Controllability
93B07   Observability
93B10   Canonical structure
93B11   System structure simplification
93B12   Variable structure systems
93B15   Realizations from input-output data
93B17   Transformations
93B18   Linearizations
93B20   Minimal systems representations
93B25   Algebraic methods
93B27   Geometric methods (including algebro-geometric)
93B28   Operator-theoretic methods [See also 47A48, 47A57, 47B35, 47N70]
93B29   Differential-geometric methods
93B30   System identification
93B35   Sensitivity (robustness)
93B36 H^{∞}-control
93B40   Computational methods
93B50   Synthesis problems
93B51   Design techniques (robust design, computer-aided design, etc.)
93B52   Feedback control
93B55   Pole and zero placement problems
93B60   Eigenvalue problems

93B99 None of the above, but in this section

93Cxx Control systems, guided systems
93C05 Linear systems
93C10 Nonlinear systems
93C15 Systems governed by ordinary differential equations [See also 34H05]
93C20 Systems governed by partial differential equations [See also 35B37]
93C23 Systems governed by functional-differential equations [See also 34K35]
93C25 Systems in abstract spaces
93C30 Systems governed by functional relations other than differential equations
93C35 Multivariable systems
93C40 Adaptive control
93C41 Problems with incomplete information
93C42 Fuzzy control
93C55 Discrete-time systems
93C57 Sampled-data systems
93C62 Digital systems
93C65 Discrete event systems
93C70 Time-scale analysis and singular perturbations
93C73 Perturbations
93C80 Frequency-response methods
93C83 Control problems involving computers (process control, etc.)
93C85 Automated systems (robots, etc.) [See also 68T40, 70B15, 70Q05]
93C95 Applications
93C99 None of the above, but in this section

93Dxx Stability
93D05 Lyapunov and other classical stabilities (Lagrange, Poisson, L^p, l^p, etc.)
93D09 Robust stability
93D10 Popov-type stability of feedback systems
93D15 Stabilization of systems by feedback
93D20 Asymptotic stability
93D21 Adaptive or robust stabilization
93D25 Input-output approaches
93D30 Scalar and vector Lyapunov functions
93D99 None of the above, but in this section

93Exx Stochastic systems and control
93E03 Stochastic systems, general
93E10 Estimation and detection [See also 60G35]
93E11 Filtering [See also 60G35]
93E12 System identification
93E14 Data smoothing
93E15 Stochastic stability
93E20 Optimal stochastic control
93E24 Least squares and related methods
93E25 Other computational methods
93E35 Stochastic learning and adaptive control
93E99 None of the above, but in this section

94–XX INFORMATION AND COMMUNICATION, CIRCUITS
94–00 General reference works (handbooks, dictionaries, bibliographies, etc.)

94–01 Instructional exposition (textbooks, tutorial papers, etc.)
94–02 Research exposition (monographs, survey articles)
94–03 Historical (must also be assigned at least one classification number from Section 01)
94–04 Explicit machine computation and programs (not the theory of computation or programming)
94–06 Proceedings, conferences, collections, etc.

94Axx Communication, information
94A05 Communication theory [See also 60G35, 90B18]
94A08 Image processing (compression, reconstruction, etc.) [See also 68U10]
94A11 Application of orthogonal functions in communication
94A12 Signal theory (characterization, reconstruction, etc.)
94A13 Detection theory
94A14 Modulation and demodulation
94A15 Information theory, general [See also 62B10]
94A17 Measures of information, entropy
94A20 Sampling theory
94A24 Coding theorems (Shannon theory)
94A29 Source coding [See also 68P30]
94A34 Rate-distortion theory
94A40 Channel models
94A45 Prefix, length-variable, comma-free codes [See also 20M35, 68Q45]
94A50 Theory of questionnaires
94A55 Shift register sequences and sequences over finite alphabets
94A60 Cryptography [See also 11T71, 14G50, 68P25]
94A62 Authentication and secret sharing
94A99 None of the above, but in this section

94Bxx Theory of error-correcting codes and error-detecting codes
94B05 Linear codes, general
94B10 Convolutional codes
94B12 Combined modulation schemes (including trellis codes)
94B15 Cyclic codes
94B20 Burst-correcting codes
94B25 Combinatorial codes
94B27 Geometric methods (including applications of algebraic geometry) [See also 11T71, 14G50]
94B30 Majority codes
94B35 Decoding
94B40 Arithmetic codes [See also 11T71, 14G50]
94B50 Synchronization error-correcting codes
94B60 Other types of codes
94B65 Bounds on codes
94B70 Error probability
94B75 Applications of the theory of convex sets and geometry of numbers (covering radius, etc.) [See also 11H31]
94B99 None of the above, but in this section

94Cxx Circuits, networks
94C05 Analytic circuit theory

94C10	Switching theory, application of Boolean algebra; Boolean functions [See also 06E30]
94C12	Fault detection; testing
94C15	Applications of graph theory [See also 05Cxx, 68R10]
94C30	Applications of design theory [See also 05Bxx]
94C99	None of the above, but in this section
94D05	**Fuzzy sets and logic (in connection with questions of Section 94) [See also 03B52, 03E72, 28E10]**

97–XX	**MATHEMATICS EDUCATION**
97–00	General reference works (handbooks, dictionaries, bibliographies, etc.)
97–01	Instructional exposition (textbooks, tutorial papers, etc.)
97–02	Research exposition (monographs, survey articles)
97–03	Historical (must also be assigned at least one classification number from Section 01)
97–04	Explicit machine computation and programs (not the theory of computation or programming)
97–06	Proceedings, conferences, collections, etc.
97Axx	**General**
97A20	Recreational mathematics [See also 00A08]
97A40	Sociological issues [See also 97C60]
97A80	Standards [See also 97B70]
97A90	Fiction and games
97Bxx	**Educational policy and educational systems**
97B10	Educational research and planning
97B20	General education
97B30	Vocational education
97B40	Higher education
97B50	Teacher education {For research aspects see 97C70}
97B60	Out-of-school education. Adult and further education
97B70	Syllabuses. Curriculum guides, official documents [See also 97A80]
97B99	None of the above, but in this section
97Cxx	**Psychology of and research in mathematics education**
97C20	Affective aspects (motivation, anxiety, persistence, etc.)
97C30	Student learning and thinking (misconceptions, cognitive development, problem solving, etc.)
97C40	Assessment (large scale assessment, validity, reliability, etc.) [See also 97D10]
97C50	Theoretical perspectives (learning theories, epistemology, philosophies of teaching and learning, etc.) [See also 97D20]
97C60	Sociological aspects of learning (culture, group interactions, equity issues, etc.)
97C70	Teachers, and research on teacher education (teacher development, etc.) [See also 97B50]
97C80	Technological tools and other materials in teaching and learning (research on innovations, role in student learning, use of tools by teachers, etc.)

97C90	Teaching and curriculum (innovations, teaching practices, studies of curriculum materials, effective teaching, etc.)
97C99	None of the above, but in this section
97Dxx	**Education and instruction in mathematics**
97D10	Comparative studies on mathematics education [See also 97C40]
97D20	Philosophical and theoretical contributions to mathematical education [See also 97C50]
97D30	Goals of mathematics teaching. Curriculum development
97D40	Teaching methods and classroom techniques. Lesson preparation. Educational principles {For research aspects see 97Cxx}
97D50	Teaching problem solving and heuristic strategies {For research aspects see 97Cxx}
97D60	Achievement control and rating
97D70	Diagnosis, analysis and remediation of learning difficulties and student errors
97D80	Teaching units, draft lessons and master lessons
97D99	None of the above, but in this section
97Uxx	**Educational material and media. Educational technology**
97U20	Analysis of textbooks, development and evaluation of textbooks. Textbook use in the classroom
97U30	Teacher manuals and planning aids
97U40	Problem books; student competitions, examination questions
97U50	Computer assisted instruction and programmed instruction
97U60	Manipulative materials and their use in the classroom {For research aspects see 97C80}
97U70	Technological tools (computers, calculators, software, etc.) and their use in the classroom
97U80	Audiovisual media and their use in instruction
97U99	None of the above, but in this section