Mathematics Subject Classification

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The **Mathematics Subject Classification (MSC)** is an alphanumerical classification scheme collaboratively produced by staff of based on the coverage of the two major mathematical reviewing databases Mathematical Reviews and Zentralblatt MATH. It is used by many mathematics journals, which ask authors of research papers and expository articles to list subject codes from the Mathematics Subject Classification in their papers. The current version is MSC2010.

Contents

Structure

The MSC is a hierarchical scheme, with three levels of structure. A classification can be two, three or five digits long, depending on how many levels of the classification scheme are used.

The first level is represented by a two digit number, the second by a letter, and the third by another two digit number. For example:

- **53** is the classification for Differential Geometry
- **53A** is the classification for Classical Differential Geometry
- **53A45** is the classification for Vector and Tensor Analysis

First level

At the top level 64 mathematical disciplines are labeled with a unique 2 digit number. As well as the typical areas of mathematical research, there are top level categories for "History and Biography", "Mathematics Education", and for the overlap with different sciences. Physics (i.e. mathematical physics) is particularly well represented in the classification scheme with a number of different categories including:

- Fluid Mechanics
- Quantum mechanics

- Geophysics
- Optics and electromagnetic theory

All valid MSC classification codes must have at least the first level identifier.

Second level

The second level codes are a single letter from the Latin alphabet. These represent specific areas covered by the first level discipline. The second level codes vary from discipline to discipline.

For example, for Differential Geometry the top level code is **53**, and the second level codes are:

- **A** for Classical Differential Geometry
- **B** for Local Differential Geometry
- **C** for Global Differential Geometry
- **D** for Sympletic Geometry and Contact Geometry

In addition the special second level code "-" is used for specific kinds of materials. These codes are of the form:

- **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.

The second and third level of these codes are always the same - only the first level changes. It is not valid to put **53-** as a classification, either **53** on its own, or better yet a more specific code should be used.

Third level

Third level codes are the most specific, usually corresponding to a specific kind of mathematical object or a well known problem or research area.

The third level code **99** exists in every category and means *none of the above, but in this section*

Using the scheme

The AMS recommends that papers submitted to its journals for publication have one primary classification and one or more optional secondary classifications. A typical MSC subject class line on a research paper looks like

MSC Primary 03C90; Secondary 03-02;

Relation to other classification schemes

For physics papers the Physics and Astronomy Classification Scheme is often used. Due to the large overlap between Mathematics and Physics research is it quite common to see both **PACS** and **MSC** codes on research papers, particularly for multidisciplinary journals and repositories

such as the arXiv.

The ACM Computing Classification System is a similar hierarchical classification scheme for Computer Science. There is some overlap between the AMS and ACM classification schemes, in subjects related to both mathematics and computer science, however the two schemes differ in the details of their organization of those topics.

The classification scheme used on the arXiv is chosen to reflect the papers submitted. As arXiv is multidisciplinary its classification scheme does not fit entirely with the MSC, ACM or PACS classification schemes. It is common to see codes from one or more of these schemes on individual papers.

First level areas

The top level subjects under the MSC are:

General / foundations

- 00: General (Includes topics such as recreational mathematics, philosophy of mathematics and Mathematical modeling.)
- 01: History and biography
- 03: Mathematical logic and foundations, including model theory, computability theory, set theory, proof theory, and algebraic logic

Discrete mathematics / algebra

- 05: Combinatorics
- 06: Order theory
- 08: General algebraic systems
- 11: Number theory
- 12: Field theory and polynomials
- 13: Commutative rings and algebras
- 14: Algebraic geometry
- 15: Linear and multilinear algebra; matrix theory
- 16: Associative rings and associative algebras
- 17: Non-associative rings and non-associative algebras
- 18: Category theory; homological algebra
- 19: K-theory
- 20: Group theory and generalizations
- 22: Topological groups, Lie groups, and analysis upon them

Analysis

- 26: Real functions, including derivatives and integrals
- 28: Measure and integration
- 30: Complex functions, including approximation theory in the complex domain
- 31: Potential theory
- 32: Several complex variables and analytic spaces
- 33: Special functions
- 34: Ordinary differential equations
- 35: Partial differential equations
- 37: Dynamical systems and Ergodic theory
- 39: Difference equations and functional equations

- 40: Sequences, series, summability
- 41: Approximations and expansions
- 42: Harmonic analysis, including Fourier analysis, Fourier transforms, trigonometric approximation, trigonometric interpolation, and orthogonal functions
- 43: Abstract harmonic analysis
- 44: Integral transforms, operational calculus
- 45: Integral equations
- 46: Functional analysis, including infinite-dimensional holomorphy, integral transforms in distribution spaces
- 47: Operator theory
- 49: Calculus of variations and optimal control; optimization (including geometric integration theory)

Geometry and topology

- 51: Geometry
- 52: Convex geometry and discrete geometry
- 53: Differential geometry
- 54: General topology
- 55: Algebraic topology
- 57: Manifolds
- 58: Global analysis, analysis on manifolds (including infinite-dimensional holomorphy)

Applied mathematics / other

- 60 Probability theory and stochastic processes
- 62 Statistics
- 65 Numerical analysis
- 68 Computer science
- 70 Mechanics (including particle mechanics)
- 74 Mechanics of deformable solids
- 76 Fluid mechanics
- 78 Optics, electromagnetic theory
- 80 Classical thermodynamics, heat transfer
- 81 Quantum theory
- 82 Statistical mechanics, structure of matter
- 83 Relativity and gravitational theory, including relativistic mechanics
- 85 Astronomy and astrophysics
- 86 Geophysics
- 90 Operations research, mathematical programming
- 91 Game theory, economics, social and behavioral sciences
- 92 Biology and other natural sciences
- 93 Systems theory; control, including optimal control
- 94 Information and communication, circuits
- 97 Mathematics education

See also

- Areas of mathematics
- Mathematical knowledge management

External links

- Mathematics Subject Classification 2010 (http://msc2010.org/mscwiki/index.php?title=MSC2010) The site where the MSC 2010 revision was carried out publicly in an MSCwiki. A view of the whole scheme and the changes made from MSC2000, as well as PDF files of the MSC and ancillary documents are there. A personal copy of the MSC in TiddlyWiki form can be had also.
- The American Mathematical Society page on the Mathematics Subject Classification (http://www.ams.org/msc/) .
- Description (http://www.math.niu.edu/~rusin/known-math/index/beginners.html) of the MSC by Dave Rusin.

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