Mathematics Subject Classification 2020*

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The latest revision of the Mathematics Subject Classi-fication (MSC) has been published, replacing the 2010 Mathematics Subject Classification (referred to as MSC2010). Searchable versions are available from the zbMATH site: https://zbmath.org/classification/ and the MathSciNet site: https://mathscinet.ams.org/mathscinet/searchMSC.html.

Mathematical Reviews (MR) and zbMATH collabo-rate on maintaining the Mathematics Subject Classifica-tion, which is used by these reviewing services, publish-ers, funding agencies and others to categorise items in the mathematical sciences literature. It is a taxonomy created by and for mathematical researchers. Every ten years, the two editorial groups solicit input from the mathematics community. For the current revision, we received over 350 comments and suggestions from more than 100 different people. MR and zbMATH carefully considered this input from the community and used it in the preparation of our joint revision of the classification.

As anticipated, there are no changes at the two-digit level, but several at the three-digit level, and hundreds at the five-digit level. Nine new three-digit classes were added: **18M** Monoidal categories and operads; **18N** High-er categories and homotopical algebra; **53E** Geometric evolution equations; **57K** Low-dimensional topology in specific dimensions; **57Z** Relations of manifolds and cell complexes with science and engineering; **60L** Rough

analysis; **62R** Statistics on algebraic and topological structures; **68V** Computer science support for math-ematical research and practice, and **82M** Basic methods in statistical mechanics. For five-digit classes, 113 classes were retired and 486 new classes were introduced. The new MSC contains 63 two-digit classifications, 529 three-digit classifications, and 6006 five-digit classifications.

There were some general changes. Descriptions of classes were changed to be more useful when searching online or via database interfaces. Previous descriptions assumed the user was looking at a full list of the classifi-cations, which would provide context. An example of the limitation is a search of MSC2010 for "optimization", which returns 18 matches, not counting essentially every class in **49** Calculus of variations and optimal control; optimization. There were three classes named "Flow control and optimization": **76B75**, **76D55**, and **76N25**. The three different contexts were incompressible invis-cid fluids, incompressible viscous fluids, and compress-ible fluids and gas dynamics. Now they have descriptions with more detail, as in **76B75** Flow control and opti-mization for incompressible inviscid fluids. There were three classes just named "Optimization" in the areas **74P** Mechanics of deformable solids, **78M50** Optics, electro-magnetic theory, and **80M50** Classical thermodynamics, heat transfer. Now they have descriptions that include the context, as in **78M50** Optimization problems in optics and electromagnetic theory.

In previous versions of the MSC, there were some "hyphen classes" of the form **XX–00** General refer-ence works, **XX–01** Introductory expositions, **XX–02**

Research exposition, **XX–03** History, **XX–04** Software, and **XX–06** Proceedings, conferences, collections, etc., along with other scattered hyphen classes. The use of hyphen classes has been made more uniform across the MSC, so that most two-digit classes now have these five subclasses. Some hyphen classes would be redundant and are omitted, such as the non-existent class **01-03**, since the two-digit class for "History of mathematics and mathematicians" does not need a subclass for history. The classes **-08** for Computational methods for problems from the parent class, **-10** for Mathematical modeling or simulation for problems from the parent class, and **-11** for Research data for problems from the parent class have been added where appropriate. For example, there is now the class **20-08** Computational methods for problems from group theory and the class **20-11** Research data for problems from group theory. An example of an omission of one of these new hyphen classes for reasons of redundancy is **65** Numerical analysis, which does not need the **-08** class for computational methods. Also, some classes have alternatives to **-08** with more detail, such as the eight five-digit classes in the three-digit class **14Q** Computational aspects in algebraic geometry. The hyphen classes **-10** mostly occur for applied classes, namely MSCs **70** through **94**, as in **70-10** Mathematical modeling or simulation for problems from mechanics of particles and systems.

The influences of data and computation on the mathematical sciences are reflected in the classes. In addition to the **-08** classes, and not including classes from **03** (Mathematical logic and foundations) or **68** (Computer science), there are 58 classes referring to computations, computational methods, or computers. For instance, for MSC2020, two new classes, **14Q25** Computational algebraic geometry over arithmetic ground fields and **14Q30** Computational real algebraic geometry were added to the three-digit class **14Q** Computational aspects in algebraic geometry, which had been added to the MSC in 1991. Similarly, two new classes were added under **37M** Approximation methods and numerical treatment of dynamical systems: **37M21** Computational methods for invariant manifolds of dynamical systems, **37M22** Computational methods for attractors of dynamical systems and **37M25** Computational methods for ergodic theory. For the **-11** classes, examples of the types of data envisioned include statistical data, mathematical tables, collections of mathematical objects and their properties, such as integer sequences (as found in the OEIS, for instance), or databases of modular forms or Calabi-Yau varieties. In addition to the **-11** classes, there are 31 classes with specific instances of data, including the new classes **62R10** Functional data analysis, **62R40** Topological data analysis and **68P27** Privacy of data.

Mathematical Reviews and zbMATH are now using MSC2020 as their classification schemes. We welcome and encourage the community to also adopt the MSC2020. It is available from msc2020.org in PDF or TeX. A SKOS version will be available later.

The classification is jointly published by the two organisations under a Creative Commons CC-BY-NC-SA license. Corrections to possible errors in the new system can be submitted by email to feedback@msc2020.org. All information about MSC2020 is jointly shared by MR and zbMATH.

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