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# The Catalyst of Science, KöMaL

## Mathematical and Physical Journal For Secondary Schools

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Mathematical and Physical Journal for Secondary Schools (KöMaL) is a journal of international renown that has been operating for more than a hundred and ten years. Since the very beginning, it has been in close touch with readers through its correspondence competitions. Many of the problem solvers of the competitions have become acknowledged members of the international intellectual community. It is a journal that aims to popularize mathematics and science, supporting, enhancing and speeding up scientific achievements. It provides opportunity for secondary-school students to publish their solutions and thus become involved in the circulation of scientific ideas.

***The History of the Journal.*** The Mathematical Journal for Secondary Schools was founded in 1893 by Dániel Arany (1863-1945), a teacher of the grammar school in Győr. A specimen issue was published in December, 1893 and the first issue came out in 1894. The declared mission of the journal was "to provide teachers and students with a resource that is rich in content". The competition launched by the monthly journal contributed to the formation of a society of distinguished mathematicians and scientists in Hungary. The names of problem solvers to become well known later on included F. Riesz (1880-1956), L. Fejér (1880-1959), D. König (1883-1944), M. Riesz (1886-1969), Gy. Szőkefalvi-Nagy (1887-1953), J. Egerváry (1891-1958), T. Radó (1895-1965) and G. Szegő (1895-1985).

From 1896 to 1914, the journal was edited by László Rátz (1863-1930), an excellent teacher of the Confessional Lutheran Grammar School (Fasori Gimnázium) in Budapest. *János (John von) Neumann (1903-1957)* and *Jenő (Eugene) Wigner (1902-1995)* were his students, too, but they did not have the opportunity to take part in the problem solving competition since the journal was not issued in their secondary-school years during World War I. Some of those who achieved well on the points competition in mathematics became prominent representatives of other disciplines: for example Tódor (Theodore von) Kármán (1881-1963) and János (John) Harsányi (1920-2000).

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Harsányi took part in the competition after the world war when the journal was launched again and edited by Andor Faragó. The subject matter of the journal was extended as reflected by the new title, "Mathematical and Physical Journal for Secondary Schools" and it aimed to develop mathematical thinking and to broaden the knowledge of natural science.

It was during this period that P. Erdős, Gy. Hajós, P. Turán, A. Rényi and other eminent Hungarian mathematicians first published in the Journal as problem solvers.

After World War II, the Mathematical Journal was reborn the third time in Szeged in the form of the Szeged Quires launched by mathematics teacher dr. Paula Soós and her young colleague János Surányi. They mimeographed and circulated the quires themselves. They stated their mission as follows: "We edit the paper to supplement secondary mathematics education. We aim to provide a pleasant experience for the student of average motivation, to help them recognize the rules and relationships and, by publishing their solutions, to encourage the expression of thoughts in clear and accurate writing." We cannot set ourselves a nobler mission than that. These were the guiding principles for J. Surányi and those who have helped and continued his work ever since: Gy. Neukomm, T. Bakos, Z. Bodó, R. Kunfalvi, Á. Szőkefalvi-Nagy, G. Tusnády, Mrs. E. Fried, L. Csirmaz, J. Pataki, E. Lugosi and V. Oláh. It would be hard to highlight the names of a few eminent problem solvers from the period after World War II since nearly all present day Hungarian mathematicians and physicists used to be participants of the points competition. While the journal was published by the János Bolyai Mathematical Society, it was fully financed by the Ministry of Education.

When the state did not finance the journal any more, it became a property of the János Bolyai Mathematical Society and the Roland Eötvös Physical Society. For fifteen years to come, the Eötvös Society took on the task of publishing the journal, too. Because of the scarcity of financial resources available for publishing and for offering awards to competition winners, a foundation was proposed by editor in chief Vera Oláh in 1997. The founders and chief supporters of the MATFUND Hungarian High School Mathematics and Physics Foundation. include members of the Academy and businessmen as well, namely Á. Császár, T. Földes, L. Lovász, M. Párkány, I. Szekeres and T. Vicsek. As students, they all qualified among the best problem solvers. Since 2007, KöMaL has been published by the MATFUND Foundation. Within the foundation, Cecília Kulcsár is in charge of the publisher's tasks.

**The point contests:** The pages of the Journal contain mathematics and physics competitions, and for nine years there has been a computer science competition, too. (There used to be computer science competitions before but those were temporary.) The board of editors is chaired by Péter Hermann in mathematics and Gyula Radnai in physics. The physics section is edited by Péter Gnädig, the computer section now edited by László Schmieder, who followed László Zsakó, Problem setting in mathematics, as well as in the other two subjects, starts with

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gathering problems. Several problems are proposed by readers. The members of the board of editors add their own suggestions, to compile an extended list of problems. About thirty problems from the list are sent to all members of the board a week before the problem setting session, so that they can think about them and decide which problems they regard the most suitable. In the session of the board, the selection process of the fifteen problems to be set is often accompanied by heated discussions. Five of the fifteen problems are designated as simpler, type C exercises, and the remaining ten as type B competition problems. Later on, three hard, type A problems are selected by Géza Kós. These hard problems provide invaluable help in the preparation for the International Mathematical Olympiad. The exercises of type K were introduced in KöMaL a few years ago, together with the ABACUS journal for primary-school students. In secondary schools, these exercises are exclusively for ninth-grade students, aiming to ease the transition and to encourage them to get involved in the competitions of KöMaL.

From September to May, the monthly issue of the journal appears by the 15<sup>th</sup> day of the month, with the problems of the month in Hungarian and in English. The participants of the competitions have nearly a month to solve the problems, write down the solutions and send them in. About one half of the solutions are received through the electronic workbook that has been in operation for five years.

It is not necessary to solve every problem to become a successful problem solver. Out of those problems sent in, the five with the largest scores count in the competition in physics, and the six best count in mathematics. It takes a lot of perseverance to send in solutions every month: the number of solutions received in September usually drops to half by the end of the school year.

The solutions are sorted, marked, and assessed by university students. Many of them used to be successful participants of the competitions themselves in their school years, that is a reason why they are doing so well in assessing the solutions. The editors check the marking and assessment, and, based on the solutions sent in, they write sample solutions for publishing in the journal. The names of the best solvers are listed under the solution. Scores are added up automatically every month. On the KöMaL homepage, everyone can follow the number of points gathered so far and their present place among the competitors in each subject and in each category. (There are students sending in problems in all three subjects)

Those finishing in the best places are given awards and their photos are printed in the journal. The award giving ceremony is held in our annual Youth Conference which is organized during the autumn break. (It used to be in the winter break earlier.) The speakers of the conferences include high-school and university teachers as well as members of the Academy and other prominent mathematicians and scientists.

This is a truly nationwide competition. Solutions are sent from more than two hundred schools of more than one hundred towns and cities in Hungary, and from more than twenty towns across the Hungarian border. In addition to ethnic Hungarians, there are solvers who sending solutions in English. The participants of

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international mathematical Olympiads (IMO) qualify in the best places in our points competition. It is reassuring to see that the results of a competition that continues all year long, based on solutions written at home accord well with the results of national competitions where candidates sit down in a room and solve problems under supervision. (These national competitions include the mathematics competition named after József Kürschák (1864-1933) the Roland Eötvös Physics Competition and the National Competition for Secondary Schools in each subject.)

**The journal:** The Mathematical and Physical Journal for Secondary Schools is most commonly known as KöMaL, an acronym out of its Hungarian title, which came into use in the 1980s. Regarding content, the editors aim to remain true to the traditions established by founders and predecessors. However, a few changes were necessary in the past few years, such as the launching of the computer science competition. The competition currently consists of four tasks per month: the first one is a mathematical problem to be solved by programming, the second and third are application problems that also help prepare for the final exams, and the fourth one is a programming task that is useful in preparation for the student olympiad. The solutions to these problems are only accepted through the electronic workbook, mailing is not possible.

Students and teachers of secondary schools pose a great demand for entrance exam problems. A full set of such problems is published each month, and the solutions are given in the following month. There have been several supplements issued that dealt with university entrance exams and final exams at both levels. The sets of final exam preparation problems were also published, edited in a volume called Higher-Level Final Examinations In Mathematics.

Four KöMaL publications have been issued in English so far. In 1994, the centennial issue was translated into English for anyone abroad who is interested. A special English issue was edited in August 1996, in honour of the International Youth Conference In Mathematics that was held in Miskolc, Hungary. The publications called C2K (Century Two of KöMaL) and C2K2 contained selections of solutions and articles of KöMaL from the periods 1994 to 97 and 1998 to 2001.

The translation of the actual month's problems into languages has been a permanent part of the Hungarian KöMaL issues for several decades. The language of the translations was French at the beginning, followed by English, Russian, Esperanto and German, as times changed. The first regular English issue of KöMaL came out in 2002, followed by five more issues that contained the solutions of the most interesting problems and selected articles of the preceding half year as well as the actual problems set in the competitions. Since the English issues did not seem to increase the demand for such publications, the editors decided to focus on publishing English content in the electronic media instead.

Some articles are accompanied by colour photos or diagrams. In order to be able to publish such pictures, the journal has got colour printed covers since September 2001. These coloured pages help visualize complicated elements of content, and

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are also used for presenting experiments, competition reports and photos of eminent teachers.

In the past few years, financial support for publishing costs and for the awards has been received from the National Office of Research and Technology (NKTH), from tenders of the Ministry of Education, from Ericsson Hungary, from the Metropolis Foundation (USA), as well as from individuals through 1% of their personal income tax offered. In addition to intellectual support, the Roland Eötvös University (ELTE) also provides office space for the editors, as well as lecturing facilities when needed.

**Development:** The KöMaL homepage is continually maintained and developed according to the needs and opinions of the readers. (At present, the editor in charge of the homepage is Rita Kós, who followed Éva Ratkó). In addition to homepage maintenance, there are a lot of other administrative duties related to the journal and the points competitions. Scores achieved by solvers and subscription data need to be recorded in databases, there is an extensive daily correspondence, the actual issue needs to be prepared for printing (this is the task of technical editor Ildikó Miklós), the internet is searched for related content, problems and articles are checked in the archive to avoid repetitions, and the archive needs to be continually refreshed. In 1994, a CD was issued that contained the scanned pages of all existing issues, as well as the wording of all the problems and the titles of the articles in searchable form.

It is from this CD that the KöMaL archives on Sulinet (a resource of teaching support materials run by the Ministry of Education) was born. The electronic archives had the full content of all issues until 1999, when Sulinet stopped operating the archives. The content of the KöMaL issues of 1994 to 2003 was published in digital form on the CD called “Aiming for the Nobel Prize”. It is since that time that the development of a modern internet based archive grown out of the CD but containing the full material of KöMaL has been in progress. The new archive will soon be presented to the public. It will contain more than thirty-five thousand pages, and it will be searchable by date, topic, and by names of authors and solvers. In addition to problems and articles, it will be possible to track down, through decades in the past, all those important national and international competitions that have played a role in mathematics, physics and computer science education in Hungary. At present, the issues of KöMaL are available at [www.komal.hu/cd](http://www.komal.hu/cd).

Together with the János Bolyai Association of Mathematics, we have developed a “problem base” to present the most significant Hungarian mathematics, physics and computer science competitions. It is available through the homepage <http://www.versenyvizsga.hu>, and it provides a unique option of searching for formulae as well.

Combining traditions and modern technology, a multiple-choice competition was launched four years ago, available at <http://www.komal.hu/teszt/teszt.cgi>. The competition addresses those students who do not have enough time to write down

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the solutions to KöMaL problems in detail and send them in. The multiple choice competition provides an opportunity to think about interesting problems and to measure one's knowledge against others month to month. Some of the questions on this competition, organized by Gergely Tassy, are competition problems that have been set before other questions are new. In this case, the speed of solving the problem matters, too, since the maximum attainable score on a question decreases by one every month.

The photos of solvers are the gems of the KöMaL-archives. The pictures of the winners of the actual year are printed in good quality in the December issue, and all photos are available at <http://www.komal.hu/tablok> in the KöMaL Picture Gallery.

Mathematical and Physical Journal for Secondary Schools represents an important part of the history of Hungarian mathematics, physics and computer science. By raising brilliant minds, it helped create a good reputation of Hungarian mathematics and science worldwide. Our mission remains as it was: to encourage our solvers and readers do develop a habit of analytical thinking, to offer them the intellectual pleasure of problem solving, and to help them learn how to express their thoughts accurately in writing. We hope that we will be able to remain true to our traditions and operate our journal in the same way in the future. In pursuing that mission, all good advice and any kind of help is welcome.