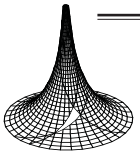

12/1 (2014), 117–134
tmcs@math.klte.hu
http://tmcs.math.klte.hu

Teaching
Mathematics and
Computer Science

Report of Meeting
Researches in Didactics of Mathematics and Computer Sciences
January 24 – 26, 2014 Eger, Hungary

The meeting Researches in Didactics of Mathematics and Computer Sciences was held in Eger, Hungary from the 24th to the 26th of January, 2014 at the Eszterházy Károly College. It was organized by the PhD School of Mathematics and Computer Sciences of the University of Debrecen and the Eszterházy Károly College in Eger.

The 58 participants – including 43 lecturers and 18 PhD students – came from 7 countries, 15 cities and represented 22 institutions of higher education.

After the warm welcome of professor Erika Pénzesné-Kónya, the dean of the Faculty of Natural Sciences of the Eszterházy College in Eger, the conference was opened by professor Gyula Maksa, leader of the Didactic Program of the PhD School of Mathematics and Computer Sciences. He welcomed the participants and emphasized the importance of the fact that the conference was held this year at a new location, in Eger, in Hungary.

The subjects presented in the lectures and posters of the conference were of great variety. Beyond the researches on the didactics of mathematics, the use of alternative methods in teaching mathematics, history of mathematics there were several lectures on different subjects in teaching computer sciences.

A very memorable event of the meeting was the sightseeing in the historical centre of Eger.

In his closing speech, professor Károly Lajkó, ex-leader of the Didactic Program of the PhD School of Mathematics and Computer Sciences and Managing

Editor of the journal "Teaching Mathematics and Computer Sciences" appreciated the high quality of the lectures, with special regard to the works of the invited lecturers and PhD students. He also gave his thanks to all the lecturers, the chairs of sessions, and also to the main organizers Eszter Herendiné-Kónya and Ilona Oláhné-Téglási, whose work essentially contributed to the success of the conference.

Subsequently, we provide the abstracts of the lectures in alphabetical order of the authors' names.

List of abstracts of lectures

András Ambrus: *Workshop in Mathematics Problem Solving*

I participated on the conference "Workshop in Mathematics Problem Solving" as an invited speaker on 10-13 December 2013 in Santiago. The conference was a joint organization to the closing conference to the Chilean-Finnish mathematical problem-solving project. The project leaders invited numerous famous researchers from all the word. Plenary speakers were: Jeremy Kilpatrick (USA, Polya's student), Jinfa Cai (USA), John Mason (England), Markku Hannula (Finland). Sixteen invited speakers gave a 45 Minutes talk with discussion. From Europe two German professors, two Finnish professor s and I were between these speakers. I followed the lectures from our PhD school too. In my talk I will present some main streams in the mathematics problem solving teaching in the world.

Gabriella Ambrus: *Modelling and problem solving in mathematics teaching*

Problem solving and the solving of modelling tasks are obviously in connection with each other. According to the Hungarian problem solving traditions this connection provides possibilities for research. In what extent can we assume for example that a good problem solver in mathematics is as good in the solving of modelling tasks? I am going to discuss this subject considering the results with modelling tasks solved by secondary school students as well.

Eszter Árokszállási: *Games and tasks in 'Remainder-Country'*

The average abilities students become puzzled in the new mathematical environment. They cannot enter the world of symbols immediately. They do not understand why they need take 'clause'. Students memorize the rules with the new operations then later they apply them incorrectly. We present a mathematical game in the arithmetic of congruence, where we solve by guessing and use

different representations. We analyse this guesswork in the new mathematical environment Modular Arithmetic and based on the final test also.

Tünde Baranyai: *Talent development at UBB Satu Mare*

The math-theme talent development program for primary school children started in January 2013 at the Satu Mare extension of the Babes-Bolyai University. In 2013-2014 school years, the third year full-time students were involved in the activities of the Math study group. After one calendar year, I made a survey among the participating children, parents and students, by using questionnaire method. The data of the survey was processed using SPSS software. The data were analyzed to assess their needs and to renew the activity. Based on my research results, I formed recommendations so that mathematics program may become more efficient.

Krisztina Barczi: *Students' explanations*

In Mathematics and mathematical explanations precise presentation, exact wording and definitions and the accurate use of mathematical concepts play an important role. In Mathematics lessons we try to manage these, however sometimes we need to use so called pedagogical language to help students understand the material. But how important are precise wording, exact explanations and logical presentation for the students? To what extent do the students recognise their significance? In discussions how often do they use mathematical terms? How exact is their wording? How precise is their presentation? The presentation tries to answer these questions with the help of analysing students' work and their discussions.

Dorottya Bessenyei: *Biadditive Functions in High School Education*

In this talk, we are going to discuss some possible applications of the theory of biadditive functions in high school education. We would like to introduce some theorems in connection with them, which are not new results, although their demonstration in high school can represent a new way in teaching talented students. By the help of these theorems we are looking for the reasons behind the well-known defining formulas of the scalar and the vector multiplication. Furthermore, we show how to use the results on biadditive functions to find the solutions of the so-called square norm equation bounded on a rectangle.

Judit Boda: *Difficulties of operations on fractions in an evening high school Debrecen*

Lifelong learning is a basic requirement for integration to society nowadays. An adequate qualification such as high school degree is particularly important for finding a job. Evening high schools can help for students aged 18 to get this qualification. My aim is to develop such a method, which can help students in acquirement of mathematical knowledge and in the exploration of relations. Since September 2013 I have been preparing a series of measurements and observations and I would like to present the first period of them. I brought operations on fractions into prominence after a general knowledge test.

Gábor Borbola: *Surfing the world of triangular numbers*

In ancient Greece, the Pythagoreans recognized several arithmetical contexts. As with the square numbers, they came to establish the concept of triangular numbers, which are formed as the sum of the first few consecutive positive integer numbers. Even more centuries later we can still find some interesting features when studying this numbers.In the presentation we are going to show several new characteristics of triangular numbers, proving their yet unknown features. Besides the algebraic proof of maths problems emphasis is put on the demonstration of the problems. The demonstration also aims to present the use of an open source tool, with which the scientific presentation can be shown in a Web browser, smart phone or tablet.

Katalin Bubnó: *Mathematical problem solving with computer programming - an experiment in secondary school*

In the semester 2013/14 in the Kossuth Lajos Secondary School of University of Debrecen we had an experiment in five study groups. We taught algorithmization and computer programming topics with solving mathematical word problems. Our hypothesizes were: this way of the processing of mathematical word problem should help to conscious mathematical knowledge; the field of algorithmization and computer programming could be less difficult for children when they have to solve well-known and not strange problems; this method is suitable for show the connection between mathematics, informatics and everyday life for those children as well, who are not interested in mathematics or informatics.

László Budai: *The assessment of spatial abilities development with dynamic tests in the high school*

The single components of the spatial ability system necessary in the possible most accurate one to define, since we can define it so punctually only, what and

how measure. Onto the level survey a measurement method with a diverse concept was making in our days, they are use. A testing procedure with a new type, which breaks with the traditions until now, is presented: the structural engineer, paper pencil basis testing it is replaced by carrying out product development with the dynamic worksheet/testing. Truth is presented furthermore with a test row with a character like this pilot examination, and its results, his experiences.

Petra Csányi - Enikő Pozsonyi - Zsanett Szabó: *Efficient Teaching of Number Theory?-The Hungarian Way*

It is a recent experience that freshmen at Universities tend to forget their mathematical knowledge from high school. It is well reflected by the fact that after writing strong High school Maternity exams they fail the intro-test at their first year. We make an attempt to follow the loss of the knowledge of students in number theory. Over a thousand questionnaires was filled in by high school sophomores and seniors and college freshmen about their experience in number theory.

Edith Debrenti: *Mean calculation in economics*

The aim of this research was to measure students' independent thinking and problem-solving skills, as well as to investigate the way they can actively apply their knowledge when solving problems not directly connected to the curriculum. We have investigated the knowledge of different means in the case of one hundred economic majors at our university. We asked them to solve exercises connected to mean calculation in order to measure how they can actively apply their knowledge, their independent thought and problem solving abilities.

Edit Földesi: *Creativity manifestations in different solutions*

Solving system of equations is mandatory in secondary school, because several other topics are based on it. It is crucial for those, who would like to continue the studies on a higher level. One of the effective methods to develop the problem solving ability is to compare and analyse the different ways of solutions.

Katalin Földesi: *Comparative analysis of the geometry contents of two Swedish syllabi using the Van Hiele theory*

The subject of my research is Swedish student teachers' formation of geometric terms. An important component of occurrences related to this is the geometry content of the syllabus. Most of my students completed their studies prior to the introduction of the new 2011 syllabus. Therefore, it is important to analyze the content of the syllabus, as it may lead to better understanding of results acquired

from other sources. I will briefly mention some viewpoints of the analysis of the syllabus as well as the Van Hiele theory and will point out research results related to this. Then, I will conduct an analysis of the geometry content of both the pre-2011 and the post-2011 syllabi, using the Van Hiele theory.

JÁN GUNČAGA: *Mathematics textbooks at the time of Austrian - Hungarian monarchy*

Franz Močnik (1814-1892) - the author of central monarchical textbooks is not unknown (Lengyelfalussy, 2011). There is a few authors in Slovakia, who study Močnik works. His textbooks were used in the year 1847 and this fact is possible to find in the school yearbooks in the archives. State Pedagogical Museum and Library in Budapest published the catalogue in 1989, that these textbooks in the year 1921 with the modification were used. It is possible to find in the yearbook of the Roman catholic secondary school in Ružemberok, that in the school years 1911/12, 1912/13 was used the textbook Močnik - Klamarik - Wagner: Algebra. In our presentation we show some examples with open source GeoGebra.

ESZTER GYIMESI: *Decomposition of rational numbers into sums of unit fractions*

Decomposition of rational numbers into sums of unit fractions dates back to ancient Egyptians. There are two possible ways to study this topic. We can investigate representations with a fixed number of terms, or decompositions into sums of non-fixed number of distinct unit fractions. In the latter case we present four algorithms, and we show that Golomb's method and the continued fraction method give the same Egyptian fraction expansions.

ESZTER HERENDINÉ-KÓNYA: *The formation of the concept of area with various activities*

It is a well-known experience that the pupils have many difficulties while solving tasks in the topic of area measurement: they try to use formulas in every case and mix up the concepts of area and perimeter. In my presentation I am speaking about a teaching experiment connected to the formation of the concept of area in classes 5, 6 and 7. The aim of the experiment is to investigate the activities which contribute to the establishment of a stabile concept image that is necessary for solving the problems concerning the area measurement.

MIKLÓS HOFFMANN: *How sharp is a curve - differential geometry in primary and secondary schools*

In this talk we will discover the possibilities how one can introduce basic differential geometric concepts and notions in primary and secondary schools.

Although calculus is deeply involved in the classical results of differential geometry, and this calculus evidently cannot be applied at these levels, we will find the way how the essential properties and the beauty of various curves and surfaces can be shown for pupils as well.

Veronika Ivancsó: *Mathematical competencies of first-year undergraduates*

I have been giving criterion subjects in mathematics for students at the ELTE Faculty of Science for years. My current project deals with the observations I have gathered during this period of time and during my high school work. I studied the tests written by students in mathematics BSc in September 2013. I chose an exercise with a stylistically simple text, in which every concept was clear from their earlier studies. Many competencies were required to solve the exercise, which were analyzed in the light of the steps of solution. I have collected the competencies a talented student need to possess, the competencies they lack according to the test, and the related problems we have to solve or develop, and have examined that which competencies are necessary to develop during high school years.

Sándor Kántor: *Mathematical-didactical definitions, theorems and proofs*

The aim of this lecture is clarify some didactical definitions, theorems and proofs which we got in consequence of analysing the tests and their official solutions of the two-level school-leaving exams of the Hungarian secondary schools. Many professional and didactical questions arose while we were dealing with the conventions of the posed and solved problems. Some of them are interesting part of the history of education. We use our analysis to make clearer the problems of textual understanding. We state that for the poor efficiency of teaching mathematics not only the absence of elaboration of the conventions is responsible but the absence of the summarizing, as well.

Tünde Kántor: *In memory of László Rátz (1863-1930)*

László Rátz was an outstanding teacher of mathematics at the Budapest Lutheran Secondary School for 35 years. He was the teacher of Jenő Wigner and János Neumann. He discovered and looked after a lot of talented students.He edited the Mathematical Journal for Secondary Schools from 1896 to 1914. He took part in the reform movement of mathematics teaching. He wrote a common schoolbook with S. Mikola, Functions and the elements of infinitesimal calculus (1910). They emphasised that the teaching of infinitesimal calculus must be based upon the concept of functions. He suggested that it would be necessary to deal more with the problems of real life in the teaching of school mathematics,

with commercial and financial problems, and with the issues of probability and life-assurance.

Sándor Király: *Some questions of teaching digital image processing through e-learning*

Which didactic methods are good for learning the current curriculum for the students who show a wide range of age, interest, chosen courses, previous studies and motivation? The solution for digital image processing course can be an e-learning curriculum which is reachable in any time and by using any device capable of internet connection, which is customisable and interactive and it can use different media during the learning process. The experiment proved that the developed material greatly improved the efficiency of learning the subject and the students' grades. The usage of LMS (Learning Management System) and the evaluation system contributed to the understanding of learning habits and allowed the material to be developed further, matching to individual students' skills.

Ferenc Klepp: *Reflections about German graduation exams*

After a brief description of the German school systems will introduce the general baccalaureate course in Baden-Württemberg and discuss the mathematics test subjects, their solutions and evaluation.

Imre Kocsis: *The role of mathematical software in engineering education from the point of view of fracture mechanics*

In this talk the role of mathematical software in engineering education is discussed from the point of view of a special engineering topic. Everyday work of engineers has been changed due to the development of widely available, high performance personal computers capable of complex engineering computing. Although users usually do not have to be familiar with the mathematical background and algorithms used by the software, there are certain problems in everyday work of engineers where complicated calculations have to be done. This is why engineering students have to be prepared for the use of mathematical software as a "calculator". The necessity of the application of mathematical software in engineering practice is illustrated through an example from fracture mechanics.

Judit Kollár: *Investigating mathematical prolegomena of students entering higher education in economy*

The fundamental courses in economic training are closely related to various topics in mathematics. These courses require multivariate analysis, multidimensional distributions. Students entering higher education should have the necessary background, concepts and patterns of thinking to be successful in their studies. I have investigated by didactically relevant tests the level of knowledge - reproduction group - of students joining higher education. The subjects of these tests were students in their last year of secondary school, and students in their first year of college education in business.

Lilla Korenova: *Blended learning in elementary and secondary education*

In the last several years the application of digital equipment's in both elementary and high schools has been steadily increasing. Many students use their very own smartphones/tablets to acquire information on various subjects or even as a calculator. Nowadays many teachers use information from the internet for educational purposes, e-tests or put their own educational material on websites accessible for the students. This new trend indicates that in the foreseeable future the combined forms of education will be preferred. In our presentation we are going to show a few examples that will demonstrate the potential that lies in the teaching of mathematics in a digital environment using "New Blended Learning World" in our presentation.

Emőd Kovács: *Family friend informatics*

Unfavourable effects have been experienced for many years that have appeared in the lives of children and adolescence in the school and private life, resulting in relationship conflicts and performance problems. These issues necessitated to build up a connection between education and health care. Our achievement is that up till now the mental health professionals and the information technology experts, dealing with teachers' training and information technology, have been working completely separately. Owing to our local circumstances we managed to group the different areas, therefore the different fields of knowledge can effectively work together in synergy. We used experiences of Safer Internet program as well. Our advantage is, that besides the regular meeting we could care with the children group for a long time.

Péter Körtesi: *Le-MATH project*

The project partnership Le-MATH: Learning mathematics through new communication factors, 526315-LLP-2012-CY-COMENIUS-CMP is aimed to develop

a methodology in teaching and learning mathematics with creating two new tools that can be used by teachers for pupils of age 9-18. The two methods are: MATHeatre: Teaching and learning mathematics through math theatre activities; MATHFactor: Teaching and learning mathematics through mathematics communication activities. The project partners have successfully completed a Math-Theatre script writing competition, and announced two international competitions for pupils: MATHeatre Europe 2014, and MATHFactor Europe 2014, see `http://www.le-math.eu`.

Gábor Kusper: *How to teach artificial intelligence for software engineers by using programming technologies*

Software Engineer BSc involves artificial intelligence (AI) and programming technologies (PT). In AI we teach graph-search algorithms, like deep-first search. In PT we teach how to use object oriented design principles. I have had the opportunity to teach both courses on the same time. I learned that my student do not use design principles at all, even I have given them ugly sample codes. As the first step I changed my examples. The new ones follow design principles and patterns. My experiences show that this helps understand programming technologies. In the article I show these sample codes.

Anita Misetáné-Burján: *The appearance of the representative features of mathematical thinking in the thinking of a chess player*

The role of thinking is significant in both mathematics and chess. Although the constant use of abstraction and the use of logical quantifiers appear in other types of thinking, it is more important in mathematics than any other type of thinking. The types of stating or proving probability and proving existence where we do not give the existing objective are mainly characterise mathematical thinking. These typical features of mathematical thinking unavoidably appear in a simple form in the youngest 12-14 year-old students' mathematical education. The exploration of the common elements of chess thinking and mathematical thinking helps in developing students' mathematical thinking by teaching chess.

Sándor Molnár: *Examining at the College of Finance and Accountancy*

The system of examination seem to be stable at the College of Finance and Accountancy at BGF. The principles of examining students haven't changed during the last 20 years. A deeper look reveals minor changes, consequences of the changing environment. Expectations have always had an impact on the tests. An unfavorable view of the society on the importance of mathematical knowledge and the changes in the financing of higher education have affected expectations

adversely. We analyze the effects of these changes on the tests given at BGF and at the College of Finance and Accountancy.

Ilona Oláhné-Téglási: *Visual Mathematics in international cooperation*

Our College takes part in the realization of a Tempus project in 2013-14, with the aim of experimental education of mathematics through visual arts, sciences and playful activities. There are 4 higher educational institutes from the European Union and 4 from Serbia in the project. The main goal of the project is to develop the Serbian mathematics education and mathematics teacher education, for that the EU partners (within the EKF) give help, and the Serbian partners also add own developments. In my lecture I'd like to give a short report on the project itself, the present status and our developments.

Tibor Radványi: *Interesting experience during our Informatics master course*

During the postal tuition of informatics master diploma we meet students owning a university degree. They are old roasters in taking exams, result-oriented, and their attitude towards working and task solving is highly above our students' who attend the Bsc course. Meanwhile their methodology training I had made a discovery which was followed by a direct examination. They were attending a practice-oriented, methodology skill developer course where they acquired to import these methods into informatics. We were learning the effect of helping tools on the learning progression. Let me introduce you to the results of our examination on the shifts of the learning pyramid and the changes we have experienced.

Richárd Rakamazi: *Diophantine equations concerning various means of binomial co-efficients*

The aim of the presentation is to show by elementary methods, that there are infinitely many different pairs of binomial co-efficient of the form $\binom{n}{2}$ such that also their arithmetic, geometric and harmonic means, resp. have the same form. We give all solutions for the arithmetic mean. We also give innately many non-trivial solutions for the arithmetic mean of three binomial co-efficient satisfying some special conditions. The proofs require the solution of some other interesting Diophantine equations, too. We use elementary methods that mostly can be discussed in secondary school, mainly within the framework of group study sessions. This explains why the means are generally analysed for two terms and for binomial co-efficient with lower value 2, since further generalizations require substantially deeper mathematical methods.

Katalin Richlik-Horváth: *Interaction between subjects when the same teacher teaches them Mathematics, Physics, Information Technology*

Concepts, phenomena and theories are often put in a different light if a Physics teacher also teaches Mathematics, Chemistry or Information Technology - even if not in the same class. Does this help or interfere with the teacher and the pupils' learning process? In my presentation, I show the different ways of introducing the concept of vectors in at least three subjects. The introduction of vectors in different subjects takes place at different times and from different points of view, which are usually not in agreement. Also, I present some problems and possible solutions to them.

Gyöngyi Szanyi: *The analysis of the development of function concept in ukrainian and hungarian curriculums and textbooks(5th-6th grade)*

The concept of function is the most fundamental concept of mathematical analysis and modern mathematics. Function has become one of the most important concepts as a way to organize and characterize mathematical relationships. The proper acquisition of function concept enables students to solve problems in mathematics or in other sciences using the corresponding function models. That's why the adequate comprehension of function concept by students at school is of great importance. My lecture reviews the analysis and comparison of Ukrainian and Hungarian curriculums and textbooks taking into account the content of topics used for developing the function concept.

Tibor Tajti: *Using evolution and neural net algorithms in e-learning system*

The intelligence of the teacher, the ability to adapt to the situation may have significant influence on the effectiveness of the teaching. We can suppose that influence in the case of e-learning, as well. In our experiment we try to measure the change of effectiveness of a simple learning system when artificial intelligence algorithms are involved.

Ferenc Várady: *You can have your cake and eat it too - or differential calculus with graphic calculator*

In the German educational system it is allowed, and even required to use the graphic calculator in secondary school mathematics education. The benefits include that the students are able to use the opportunities offered by information technology. For solving mathematical problems with a computer or a graphic calculator it is essential that the pupils are self-confident about using mathematical formulas, and they have to know the functions of the calculator to use them correctly. In my work I try to point out specific examples of how the calculator is

used in the mathematics education to fully exploit the benefits of it while avoiding the potential pitfalls.

Éva Vásárhelyi: *Research in Mathematics-Didactics is about Mathematics itself - as well*

A common feature of research in mathematics-didactics and other kinds of specific and general didactical research is that all of them rely on results of other fields of science. A specific feature of mathematical-didactical research is that its very subject is the transformation and channeling the methods, tools and results of mathematical exploration. This applies on different levels of learning, from an intuitive notion up to a highly elaborated mathematical conception. Mathematics has a key role in both approaches. In this presentation we focus on the mathematical description of pedagogical situations.

Emilia Velikova: *Creating a mathematical teaching and learning environment for stimulating mathematical creativity*

The report presents: some basic theories of creativity, creative-productive giftedness, school giftedness, mathematical giftedness; well-known programs for identification, motivation and support of mathematical gifted students. The lecture specifically focuses on the possibilities of creating a mathematical teaching and learning environment for stimulating mathematical creativity of creative-productive gifted students on the base of: creating, developing and applying specific mathematical contents; applying a pedagogical model for teaching mathematics that supports students' creative independent work in Mathematics.

László Zsakó: *Curriculum theory of informatics*

In the case of informatics, contrary to many school subjects, the question of what should be included in the curriculum is highly relevant. The subject of informatics and its parts are defined in a number of different ways all around the world: Information and Communication Technology (ICT), Computer Science (CS), Information Technology (IT), and Digital Literacy (DL). When making a modern curriculum, however, we need to bear in mind why a given theme is beneficial to be taught; for such questions information competencies can serve as guidelines. When constructing the various themes, on the other hand, we have to consider conceptual factors, that is, the abstraction level of the given age group. For this it is essential to be aware of the basic terms of informatics and their applications.

List of abstracts of posters

Rita Nagy-Kondor - Turgut Melih: *Spatial ability of Hungarian and Turkish prospective mathematics teachers*

In this paper we investigate and compare spatial abilities of prospective elementary mathematics teachers from Hungary and Turkey. We prepared the tests in a way that it contained the important components of the spatial ability (imaginary manipulation of the object, projection description and projection reading, reconstruction, transparency of the structure). By right of the curriculum of the two countries we can say that for teaching the spatial geometry small time has left in both countries. The results of the survey verify that many students have problems with imagining a spatial figure and therefore to solve the spatial geometry exercises. In the future we plan to make special interactive worksheet to develop of spatial ability.

Rita Nagy-Kondor - Gusztáv Áron Szíki: *GeoGebra animations for the course book "Mathematical tools in engineering applications"*

It is five years now that we have published the course book "Mathematical tools in engineering applications". This book demonstrates the application of mathematical tools (vectors, matrices, linear functions and complex numbers) on problems that are typical in the field of Physics, Technical Mechanics, Thermodynamics and Electrical Engineering. This year we intend to publish the second part of the book in the same form and with the same build up as the first one. To help the students to understand the engineering content and also its relationship with the mathematical content more easily we built GeoGebra animations into the book. We present examples to these animations with the related engineering problems here.

Adrienn Vinczéné-Varga - Csaba Kézi - Erika Perge: *Colours, numbers, shapes, motions - aspects of engineering*

The Department of Basic Courses of Technology at Faculty of Engineering (University of Debrecen) organized a series of meetings for students in secondary schools. The aim of the project is to familiarize and propagate the programs of Faculty of Engineering. The meetings are organized and delivered by the members of the staff of the Department. The poster contains the short descriptions of the components of our project together with some photographic documentation.

List of participants

1) András Ambrus, Eötvös L. University, Mathematics Teaching and Education Centre, Budapest, Hungary, ambrus@cs.elte.hu
2) Gabriella Ambrus, Eötvös L. University, Mathematics Teaching and Education Centre, Budapest, Hungary, ambrusg@cs.elte.hu
3) Eszter Árokszállási, Vak Bottyán High School, Paks, Hungary, arokszallasieszter@gmail.com
4) Tünde Baranyai, Babeş-Bolyai University, Faculty of Psychology and Educational Sciences, Satu Mare, Romania, baratun@yahoo.com
5) Krisztina Barczi, Neumann János High School, Eger, Hungary, bkrixta@gmail.com
6) Dorottya Bessenyei, Kossuth Lajos Teacher Training Grammar School of the University of Debrecen, Debrecen, Hungary, dorka.nadasi@gmail.com
7) Mihály Bessenyei, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, besse@science.unideb.hu
8) Csaba Bíró, Eszterházy Károly College, Institute of Mathematics and Informatics, Eger, Hungary, csaba.biro.ekf@gmail.com
9) Judit Boda, University of Debrecen, Institute of Earth Sciences, Debrecen, Hungary, boda.judit@science.unideb.hu
10) Gábor Borbola, Szent István University, Faculty of Economics, Agriculture and Health Studies, Gyula, Hungary, borbola.gabor@gk.szie.hu
11) Katalin Bubnó, University of Debrecen, Faculty of Informatics, Debrecen, Hungary, bubno.kati@gmail.com
12) László Budai, II. Rákóczi Ferenc High School, Szécsény, Hungary, budai0912@gmail.com
13) Petra Csányi, Eötvös Lorand University, Faculty of Science, Budapest, Hungary, pepi8@freemail.hu
14) Csaba Csapodi, Trefort Teacher Training Grammar School of the Eötvös Loránd University, Budapest, Hungary, csapodi.csaba@trefort.elte.hu
15) Edith Debrenti, Partium Christian University, Oradea, Romania, edit.debrenti@gmail.com
16) Edit Földesi, Tamási Áron Primary and Secondary School, Budapest, Hungary, f.ditti@vipmail.hu

17) Katalin Földesi, Malardalens Högskola, Sweden, katalin.foldesi@mdh.se

18) Ján Gunčaga, Catholic University in Ružomberok, Faculty of Pedagogy, Ružomberok, Slovakia, jan.guncaga@ku.sk

19) Eszter Gyimesi, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, gyimesie@science.unideb.hu

20) Eszter Herendiné-Kónya, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, eszter.konya@science.unideb.hu

21) Miklós Hoffmann, Eszterházy Károly College, Institute of Mathematics and Informatics, Eger, Hungary, hofi@ektf.hu

22) Veronika Ivancsó, Jedlik Ányos Secondary Grammar School, Budapest, Hungary, ivancsoveronika@gmail.com

23) Sándor Kántor, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, kantor.sandor@science.unideb.hu

24) Tünde Kántor, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, tkantor@science.unideb.hu

25) Csaba Kézi, University of Debrecen, Faculty of Engineering, Debrecen, Hungary, kezicsaba@science.unideb.hu

26) Sándor Király, Eszterházy Károly College, Institute of Mathematics and Informatics, Eger, Hungary, ksanyi@aries.ektf.hu

27) Ferenc Klepp, Germany, feri.klepp@web.de

28) Imre Kocsis, University of Debrecen, Faculty of Engineering, Debrecen, Hungary, kocsisi@eng.unideb.hu

29) Judit Kollár, Budapest Buisness School, College of Finance and Accountancy, Budapest, Hungary, zolna1@freemail.hu

30) Lilla Koreňová, Comenius University, Bratislava, Slovakia, korenova@fmph.uniba.sk

31) Emőd Kovács, Eszterházy Károly College, Institute of Mathematics and Informatics, Eger, Hungary, emod@aries.ektf.hu

32) Veronika Kovács, Eötvös Lorand University, Faculty of Science, Budapest, Hungary, vkovacs@cs.elte.hu

33) Péter Körtesi, University of Miskolc, Miskolc, Hungary, matkp@uni-miskolc.hu

34) Gábor Kusper, Eszterházy Károly College, Institute of Mathematics and Informatics, Eger, Hungary, gkusper@aries.ektf.hu

35) Károly Lajkó, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, lajko@science.unideb.hu

36) Gyula Maksa, University of Debrecen, Institute of Mathematics, Debrecen, Hungary, maksa@science.unideb.hu

37) Anita Misetáné-Burján, Karádi Lower-Secondary School, Balatonlelle, Hungary, anitachess64@gmail.com

38) Sándor Molnár, Budapest Buisness School, College of Finance and Accountancy, Budapest, Hungary, Molnar.Sandor@pszfb.bgf.hu

39) Rita Nagy-Kondor, University of Debrecen, Faculty of Engineering, Debrecen, Hungary, rita@eng.unideb.hu

40) Ilona Oláhné-Téglási, Eszterházy Károly College, Faculty of Mathematics and Informatics, Eger, Hungary, olahneti@ektf.hu

41) Dorka Palotay, Eötvös Lorand University, Faculty of Science, Budapest, Hungary, dpalotay@cs.elte.hu

42) Enikő Pozsonyi, Eötvös Lorand University, Faculty of Science, Budapest, Hungary, pozsiencsi@gmail.com

43) Erika Perge, University of Debrecen, Faculty of Engineering, Debrecen, Hungary, perge@ang.unideb.hu

44) Tibor Radványi, Eszterházy Károly College, Faculty of Mathematics and Informatics, Eger, Hungary, radvanyi.tibor@ektf.hu

45) Richárd Rakamazi, Baár-Madas Reformed Grammar School, Budapest, Hungary, raka82@gmail.com

46) Katalin Richlik-Horváth, Fazekas Mihály Teacher Training School of the Eötvös Loránd University, Budapest, Hungary, richlik@fazekas.hu

47) Csaba Szabó, Eötvös Lorand University, Faculty of Science, Budapest, Hungary, csaba.cs.elte.hu

48) Zsanett Szabó, Eötvös Lorand University, Faculty of Science, Budapest, Hungary, sszani@freemail.hu

49) Gyöngyi Szanyi, Grammar School of Nagydobrony, Nagydobrony, Ukraine, szanyi.gyongyi@science.unideb.hu

50) Gusztáv Áron Szíki, University of Debrecen, Faculty of Engineering, Debrecen, Hungary, szikig@eng.unideb.hu

51) Tibor Tajti, Eszterházy Károly College, Faculty of Mathematics and Informatics, Eger, Hungary, tibor.tajti@gmail.com

52) Viktor Takács, University of Debrecen, Debrecen, Hungary, takacs.viktor@fin.unideb.hu

53) Ferenc Várady, Budapest Buisness School, College of Commerce, Catering and Tourism, Budapest, Hungary, varadyf@gmail.com

54) Magda Várterész, University of Debrecen, Faculty of Informatics, Debrecen, Hungary, varteresz.magda@inf.unideb.hu

55) Éva Vásárhelyi, Eötvös L. University, Mathematics Teaching and Education Centre, Budapest, Hungary, kvidermanova@ukf.sk

56) Emilia Velikova, University of Russe, Faculty of Natural Sciences and Education, Russe, Bulgaria, evelikova@uni-ruse.bg

57) Adrienn Vinczéné-Varga, University of Debrecen, Faculty of Engineering, Debrecen, Hungary, vargaa@eng.unideb.hu

58) László Zsakó, Eötvös Lorand University, Faculty of Informatics, Budapest, Hungary, zsako@caesar.elte.hu

(Compiled by E. Herendiné-Kónya and I. Oláhné-Téglási)