ABSTRACTS OF SCIENTIFIC PUBLICATIONS

of Assoc. Prof. Tanka Milkova, PhD, Department of Statistics and Applied Mathematics, University of Economics – Varna, for participation in a competition for "Professor" in the scientific specialty "Quantitative Methods in Logistics (Inventory Management)"

I. Monograph

№	Group number	Title
1.	1.	*Milkova, Tanka. (2023) Models for the optimal management of inventories in the logistics system. Varna: Science and Economics, Monographic Library Prof. "Tsani Kalyandziev".* Inventories are to be found everywhere in the logistics system and the fact that they ensure the regular and continuous accomplishment of each activity, on the one hand, and involve a considerable financial resource, as well as generate costs for their management, on the other, determines the relevance of the issue of the optimal management of the former. The management of inventories in the logistics system includes a set of a wide range of processes and activities, in the accomplishment of which it is advisable to use quantitative methods, in view of obtaining optimal performance. In the present monographic work there is defended the thesis that the construction of new models for the optimal management of inventories in the logistics system and the modification of existing ones can lead to the optimization of various logistics activities in the area of inventories, in their actual practical application. Investigated are some possibilities for adaptation and modification of the existing methods of classification of the nomenclature of inventories into groups, according to their degree of importance for the activity of the organization in accordance with different indicators, as are developed analyses of the findings in view of the optimal realization of the respective activities. There are also studied various possibilities for the design of new and the modification of existing models for the management of inventories under deterministic as well as stochastic processes, developed are methods for their solution, as are analyzed the obtained optimal results with a view to minimizing the total cost of their management.

II. Other monographs

№	Group number	Title
2.	1.	*Vasilev, J., Milkova, T. Optimisation Models for Inventory Management with Limited Number of Stock Items. Logistics, MDPI, 6, 2022, 3.* Stocks of raw materials and finished products are found in all units of logistics systems and require significant financial means of management. For this reason, scientifically justified approaches to stock management and cost minimisation must be explored. Despite the existence of many such approaches in literature and practice, each case

		has its own specificities and specificities to which stock management models should be adapted. In this article, the aim of the authors is to propose an approach to determine optimal supply sizes from different types of stocks (more than one is known in the literature as multi-nomenclature) that minimises only the cost of inventory management. The cost of inventory is not included. Methods: The article used the methods of mathematical optimisation, the method of least squares, and regression analysis. The scope of the models in the article is inventory management, with a limited number of stock keeping units. Time series data for the delivered quantities and time series data for the costs of stock management are used. Both time series use the same time period. Results: The constructed specific nonlinear mathematical models for optimising the total cost of stock management are approbated based on sample data and the results obtained are analysed. Conclusions: The created mathematical models and methods for optimising the total cost of stock management may be used by logistics managers to minimise the total costs of inventory management.
3.	2.	*Vasilev, J., Nikolaev, R., Milkova, T. Transport Task Models with Variable Supplier Availabilities. Logistics, MDPI, 7(3):45, 2023.* With regard to the definition of an optimal transport plan for some material flow in the logistics system in literature and practice, the classical transport task model is developed. The minimization of total transport costs is usually considered for optimality. Some modifications to the classical transport task have also been developed. Methods: The article uses the methods of linear optimization. Based on these methods, two modified transport task models have been constructed, which consider the possibility of planning in advance the quantities available from the suppliers of the transported cargo. These models are applicable in SCM for pharmaceuticals with a national logistics hub. Furthermore, a solver in MS Excel is used to determine the optimal solution of optimization models. Results: Two new (modified, extended) models of the transport task have been constructed, in which a preliminary planning of the available quantities of the transported cargo at the suppliers is made. These quantities shall be planned in such a way as to ensure a minimum total transport cost. Conclusions: By applying the proposed new transport task models, lower total transport costs for carrying out imported pharmaceuticals can be ensured compared to an application of the classical transport task model.
4.	3.	*Milkova, T. (2024). Solving economic problems through analytical geometry. // Mathematics Plus. Sofia: Archimedes, № 4, pp. 42-63.* Analytic geometry is a part of mathematics that studies geometric objects with the help of means from algebra. The methods of analytical geometry are a powerful tool for modelling various economic phenomena and processes, and this provides an opportunity to determine optimal decisions and make informed decisions. Here some basic statements of analytical geometry are presented theoretically and

		demonstrate their possibilities for solving economic problems. tasks through specific examples developed on the basis of conditional data.
5.	4.	*Nikolaev, R., D. Zhelyazkova, T. Milkova, R. Miryanov, V. Yordanova (2019). Optimization of economic processes in the production and transport system of the enterprise. Varna: Science and Economics, Monographic Library Prof. "Tsani Kalyandziev", (Chapter IV – pp. 155-189).* Economic operators operating in conditions of uncertainty and highly competitive environment strive to achieve optimal results of their activities. One of the possibilities in this direction is associated with the proper planning of economic processes taking place within the scope of the production and transport system of the enterprise, where objective conditions for conducting in-depth studies of theoretical and applied nature are established. The monographic works defend the thesis that the proposed economic analyses, the constructed new and modified existing production-transport single-product and multi-product models, as well as the post-optimal analyses, will reveal some specific opportunities for optimization of various economic processes taking place in the transport and logistics systems of enterprises. The studies carried out are generally reduced to: laying methodological foundations for freight management in transport and logistics systems; development of single-product production and transport models, with and without parameter, development of analytical methods for their solution, as well as performance of post-optimal analyses of the results; development of multi-product production and transport models, offering analytical methods for solving and demonstrating the possibilities for their application.
6.	5.	*Grozdev, S., Lilkova, M., Stoeva, T., Ivanova, P., Petrova, R., Pencheva, G., Matakieva, S., Stefanova, D., Petrova, E., Chalakova, K., Marinova, E., Dankov, D., Kyoseva, M., Kostadinova, M., Vitanov, T., Isufov, R., Sharkova, I., Raykov, N., Nakov, S., Nikolaev, R., Nenkov, V., Madzharova, T., Raeva, I., Milkova, T., Miryanov, R. (2019). European Kangaroo 2019: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association.* The interest in the International mathematical competition "European Kangaroo" is huge. During the last edition in March 2019, more than 7 million people took part in the competition. students from over 80 countries. Bulgaria is one of the first countries to be a full member of the big family of "kangaroos". This year, nearly 45 thousand students from Bulgaria took part in the competition. The reason for this considerable interest is primarily in the nature of the tasks. Most of them are models of real practical situations that are presented in an entertaining way. This book contains the topics for all age groups from first to twelfth grade. The tasks from both the Regional and National Circles are included and all are accompanied by detailed solutions. The methodological nature of the decisions makes them understandable. The

		authors hope that through them the students will increase their knowledge so that their participation in the upcoming competitions, competitions and external assessments, as well as in the next editions of "European Kangaroo" will become even more successful.
7.	6.	*Grozdev, S., Lilkova, M., Stoeva, T., Ivanova, P., Petrova, R., Pencheva, G., Matakieva, S., Stefanova, D., Petrova, E., Chalakova, K., Marinova, E., Dankov, D., Kyoseva, M., Kostadinova, M., Vitanov, T., Isufov, R., Sharkova, I., Raykov, N., Nakov, S., Nikolaev, R., Miryanov, R., Milkova, T., Nenkov, V., Madzharova, T., Raeva, I. (2020). European Kangaroo 2020: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association.* This book contains the tasks and topics for all age groups from first to twelfth grade from the International Mathematical Competition "European Kangaroo" for 2020, which was not held due to the pandemic. The authors offer methodological solutions that make it possible to understand the ideas and ways of guessing. This makes the tasks understandable and useful for future participation in competitions, competitions and external assessments. The goal is to increase the knowledge and mathematical culture of readers. A large part of the tasks are models of real practical situations that are presented in an entertaining way. That doesn't make them any easier. On the contrary, very often students face serious challenges.
8.	7.	*Grozdev, S., Lilkova, M., Stoeva, T., Ivanova, P., Petrova, R., Pencheva, G., Matakieva, S., Stefanova, D., Petrova, E., Chalakova, K., Marinova, E., Dankov, D., Kyoseva, M., Bobeva, G., Kostadinova, M., Vitanov, T., Isufov, R., Sharkova, I., Raykov, N., Nakov, S., Nikolaev, R., Miryanov, R., Milkova, T., Nenkov, V., Madzharova, T., Raeva, I. (2021). European Kangaroo 2021: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association.* This book contains the 2021 topics of the International Mathematical Competition "European Kangaroo". These are the tasks and solutions for grades 1 - 4 from March 18, 2021, as well as those for grades 5 - 12 from May 29, 2021. but also with an increase in mathematical culture. We hope that the proposed methodological solutions, which are the work of an impressive team of teachers, lecturers and specialists, will contribute to their implementation. The authors hope that through them the students will increase their knowledge so that their participation in the upcoming competitions, competitions and external assessments, as well as in the next editions of "European Kangaroo" will become even more successful.

9.	8.	*Grozdev, S., Sharkova, I., Todorova, P., Petrova, R., Kostadinova, M., Matakieva, S., Petleshkov, K., Georgieva, M., Georgiev, S., Stefanova, D., Marasheva, I., Alashka, R., Stefanov, S., Petkov, Y., Staribratov, I., Pavlov, V., Nikolaev, R., Nenkov, V., Milkova, T. (2022). Mathematical Olympiad in Financial Literacy: Problems and Methodological Solutions, 2021, 2022. Sofia: Mathematical Library European Kangaroo Association.* The main goals of the authors are related to increasing students' interest in building modern skills, creating social responsibility for managing personal finances and investing, motivating students and teachers to increase their success in the teaching process and acquiring financial literacy as part of functional literacy. The main tools are the knowledge and skills in mathematics for the respective age groups, traditionally used in the formation of competencies in most general education and specialized subjects. This book is a collective monograph that contains the topics of 2021 and 2022 (original author's mathematical problems), and their methodological solutions are also proposed. Increasing functional literacy and computational abilities, including using a calculator, as well as getting acquainted with ideas for solving the problems from the proposed collective monograph, increase the reader's chances of success in the competitions and competitions that are ahead.
10.	9.	*Grozdev, S., Sharkova, I., Todorova, P., Petrova, R., Kostadinova, M., Matakieva, S., Petleshkov, K., Georgieva, M., Georgiev, S., Stefanova, D., Marasheva, I., Alashka, R., Stefanov, S., Petkov, Y., Staribratov, I., Pavlov, V., Nikolaev, R., Nenkov, V., Milkova, T. (2022). Mathematical Olympiad in Financial Literacy: Problems and Methodological Solutions, 2019, 2020. Sofia: Mathematical Library European Kangaroo Association.* The main goals of the authors are related to increasing the interest of students in building modern skills and acquiring financial literacy. The main tools are the knowledge and skills in mathematics for the respective age groups, traditionally used in the formation of competencies in most general education and specialized subjects. The Financial Literacy Competition provides an opportunity to: develop computational abilities, including using a calculator; motivating students to choose the right mathematical approach and its argumentation in solving practical problems, including problems from economics, finance, insurance, banking and entrepreneurship. This book – a collective monograph, contains the topics from 2019 and 2020 (original author's mathematical problems), and their methodological solutions are also proposed. Increasing functional literacy and computational abilities, including using a calculator, as well as getting acquainted with ideas for solving the problems from the proposed collective monograph, increase the reader's chances of success in the competitions and competitions that are ahead.

		Grozdev, S., Lilkova, M., Stoeva, T., Ivanova, P., Petrova, R., Pencheva, G., Matakieva, S., Stefanova, D., Petrova, E., Chalakova, K., Marinova, E., Nikolova, G., Dankov, D., Bobeva, G., Kostadinova, M., Isufov, R., Sharkova, I., Todorova, P., Raykov, N., Nakov, S., Petkov, Y., Raeva, I., Rahnev, A., Nikolaev, R., Nenkov, V., Madzharova, T., Milkova, T. (2022). European Kangaroo 2022: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association. The interest in the International Mathematical Competition "European Kangaroo" is constantly growing. Students from over 80 countries take part in it. The reason for this considerable interest is primarily in the nature of the tasks. Many of them are models of real practical situations that are presented in an entertaining way. That doesn't make them any easier. On the contrary, very often students face serious difficulties. But the pleasure of being able to solve such a problem is indescribable. Here are the problems and solutions for all classes of Bulgarian Kangaroo, held on 05.02.2022, European Kangaroo, held on 17.03.2022 and Kangaroo Plus, held on 16.04.2022. We hope that the proposed methodological solutions, which are the work of an impressive team of teachers, lecturers and specialists, will contribute to their implementation.
11.	10.	
		Lilkova, M., Stoeva, T., Petrova, R., Pencheva, G., Matakieva, S., Stefanova, D., Chalakova, K., Marinova, E., Nikolova, G., Dankov, D., Bobeva, G., Kostadinova, M., Isufov, R., Sharkova, I., Todorova, P., Raykov, N., Nakov, S., Stefanov, St., Staribratov, I., Raeva, I., Grozdev, S., Nikolaev, R., Nenkov, V., Madzharova, T., Milkova, T. (2023). European Kangaroo 2023: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association. The interest in the International Mathematical Competition "European Kangaroo" is enormous. During the last edition in March 2023, 56,568 Bulgarian students took part in the competition. The record number of 50,000 from 2018 and 2019 has been surpassed, and although the name says "European", Europe's borders are open to the whole world. Only in the first years the competition was truly European. Gradually, representatives of other continents joined the participating countries: North and South America, Asia and Africa. Bulgaria is one of the first countries to be a full member of the big family of "kangaroos". Here are the tasks and solutions for all classes of Bulgarian Kangaroo, held on 11.02.2023, European Kangaroo, held on 16.03.2023 and Kangaroo Plus, held on 29.04.2023.
12.	11.	

13.	12.	*Sharkova, I., Todorova, P., Petrova, R., Kostadinova, M., Bobeva, G., Chalakova, K., Marinova, E., Matakieva, S., Stefanova, D., Marasheva, I., Alashka, R., Stefanov, S., Staribratov, I., Grozdev, S., Nikolaev, R., Nenkov, V., Milkova, T. (2023). Mathematical Olympiad in Financial Literacy: Problems and Methodological Solutions, 2023. Sofia: Mathematical Library European Kangaroo Association.* The main goals of the authors are related to increasing students' interest in building modern skills, creating social responsibility for managing personal finances and investing, motivating students and teachers to increase their success in the teaching process and acquiring financial literacy as part of functional literacy. The main tools are the knowledge and skills of mathematics for the respective age groups, traditionally used in the formation of competencies in most general education and specialized subjects. This book – a collective monograph, contains the topics (original author's problems) from the Regional and National Round of 2023, a topic for students, and their methodological solutions are also proposed.
14.	13.	*Sharkova, I., Petrova, R., Chalakova, K., Marinova, E., Matakieva, S., Stoeva, T., Karapeeva, V., Ognyanova, D., Stefanova, D., Marasheva, I., Nestorova, R., Alashka, R., Delinov, E., Milkova, T., Grozdev, S., Nikolaev, R., Nenkov, V. (2024). Mathematical Olympiad in Financial Literacy: Problems and Methodological Solutions, 2024. Sofia: Mathematical Library European Kangaroo Association.* The main goals of the authors are related to increasing students' interest in building modern skills, creating social responsibility for managing personal finances and investing, motivating students and teachers to increase their success in the teaching process and acquiring financial literacy as part of functional literacy. The main tools are the knowledge and skills of mathematics for the respective age groups, traditionally used in the formation of competencies in most general education and specialized subjects. This book – a collective monograph, contains the topics (original author's problems) from the Regional and National Round of 2024, a topic for students, and their methodological solutions are also proposed.
15.	14.	*Lilkova, M., Matakieva, S., Petrova, R., Raykov, N., Sharkova, I., Stoeva, T., Pencheva, G., Dankov, D., Nikolova, G., Chalakova, K., Marinova, E., Kostadinova, M., Nakov, St., Nestorova, R., Ivanova, P., Stefanova, D., Bobeva, G., Raeva, Ill., Madzharova, T., Milkova, T., Grozdev, S., Nikolaev, R., Nenkov, V. (2024). European Kangaroo 2024: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association.* The interest in the International Mathematical Competition "European Kangaroo" is constantly growing. Students from over 80 countries take part in it. The reason for this considerable interest is primarily in the nature of the tasks. Many of them are models of real practical situations

		that are presented in an entertaining way. That doesn't make them any easier. On the contrary, very often students face serious difficulties. Here are the tasks and solutions for all classes of: Bulgarian Kangaroo, held on 24.02.2024; European Kangaroo, held on 21.03.2024 and Kangaroo Plus, held on 20.04.2024. We hope that the proposed methodological solutions, which are the work of an impressive team of teachers, lecturers and specialists, will contribute to their implementation. The authors hope that through them the students will increase their knowledge so that their participation in the upcoming competitions, competitions and external assessments, as well as in the next editions of the European Kangaroo, will become even more successful.

III. Scientific Articles

№	Group number	Title
16.	1.	*Forkunova L.V., Lukina V.S., Milkova T.V. (2017). The First International Olympiad in Financial and Actuarial Mathematics: Results in the Arkhangelsk Region. Modern Problems of Science and Education – No 4.* The article contains the goals of the international Olympiad in financial and actuarial mathematics. Its tasks are considered as part of the work to raise the level of financial literacy of the population in Russia in general, and young people in particular. The tasks of the first Olympiad are given. Both author's and alternative solutions are disassembled. Mathematical and economic skills necessary for the solution of the presented problems are analyzed. Opportunities for students of mathematicians and economists to use them was shown. The diagrams show the number of students of three institutes of the Northern (Arctic) Federal University named after M.V. Lomonosov who have completed assignments. According to the data are given the conclusions. Based on the seconclusions, the authors formulated the recommendations for the developers of the next Olympiad.
17.	2.	*Nikolaev, R., T. Milkova (2017). Determining the number of the roots of a class of third order parametric algebraic equations. // Mathematics and Informatics, № 4, Sofia: Az Buki, pp. 370 – 376.* The article is devoted to a methodology of determining the number of the roots of a class of cubic algebraic equations with real parameters in which one of the roots can be determined directly. A more general approach is presented too using derivatives and graphical representations of functions.
18.	3.	*Milkova, T., Miryanov, R. (2017). One approach for minimising the average turnaround time in Varna West Port Terminal. Economics and computer science, Varna: Knowledge and business, 6, pp.14-18.* One of the most important criteria for port efficiency nowadays is the average turnaround time. More and more port terminals are assessed by

		this indicator, so its value turns to be one of the crucial factors for ports competitiveness and consequently minimising the turnaround time becomes one of the most important objectives of the ports. The purpose of this research paper is to propose one interesting tool for optimising this indicator by using the famous Simplex method of linear programming. After giving the approach some exemplary models are solved with real values based on statistics for Varna West Port Terminal which will make the design of the paper original in both directions – theoretical and practical, so that despite some limitations concerning the trade secret, the scope of the material is large enough to be used for any port with any data, even exemplary and/or approximate. The aforementioned practical implications could be pointed out as the main contribution of this paper and the easy way for calculating the final results makes the algorithm really applicable so that each port can make its own conclusion based on its particular statistical data.
19.	4.	*Nikolaev, R., Milkova, T. (2017). Applied aspects of optimal positioning of units in logistics systems. // Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series, pp. 148-157.* In the present research paper some applied aspects of the problem for optimal positioning of units in logistics systems are examined, aiming minimizing the transportation costs in order to secure communication between units. The authors base the research on their former theoretical studies in which they propose different approaches for optimization based on the analytical geometry methods. On that base the units in the logistics systems are treated as points in Cartesian coordinate system and the coordinates of such points are determined for positioning the units with an aim to minimize the overall distances between the interconnected units with assuming some given constraints.
20.	5.	*Nikolaev, R., Milkova, T., Petkov, Y. (2017). Some Numerical Sequences Concerning Square Roots (Part Two). // Mathematics and Informatics, № 6, Sofia: Az Buki, pp. 616-625.* The present article is a continuation of the homonymous publication in the journal "Mathematics and Informatics", issue 5, 2017. The theoretical considerations in it cover all cases when calculating the value of a finite and infinite number of nested square radicals.
21.	6.	*Nikolaev, R., T. Milkova, R. Miryanov (2018). Some types of problems with symmetric numbers. // Mathematics and Informatics, № 2, Sofia: Az Buki, c. 200-205.* The so called "symmetric" numbers are considered in the paper and the authors study some of their various properties. Several interesting questions and problems for numbers of that kind are formulated and some concrete examples are solved. Corresponding generalizations of them are proposed. The investigation could be a base for creating many

		other problems, which could be used in mathematical Olympiads and competitions, as well as for the preparation for them.
22.	7.	*Nikolaev, R., T. Milkova, K. Chalakova (2018). Combinatorial problems related to triangles. // Mathematics and Informatics, № 5, Sofia: Az Buki, pp. 506-517.* The present paper considers an application of the triangle inequality to integer triangles. Formulae are found for their number in the cases of equilateral, isosceles and scalene triangles. The formulae give opportunities for quick problem solving in regular math classes at school as well as at the level of competitions.
23.	8.	*Nikolaev, R., T. Milkova, R. Miryanov (2018). A new meaning of the notion "Expansion of a number". // Mathematics and Informatics, № 6, Sofia: Az Buki, p. 596-602.* In the present paper a new meaning of the notion "expansion of a number" is proposed by the authors. Some interesting problems are considered with corresponding answers and summarized results. The idea is by means of only one digit (used several times) and different mathematical symbols, signs and operations, to express (to expand) other digits. The research could be used by students and teachers to generate new examples with educational purposes or to find alternative variants of the problems in the paper.
24.	9.	*Nikolaev, R., T. Milkova (2018). Optimizing the transport using costs and time criteria. // Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series, vol. 7, № 2, pp. 133-141.* Considering the need of every business company, which is managed rationally, to maintain high levels of efficiency, a special attention should be paid on all the costly activities, some of them concerning the transportation of material flows. These needs are covered by different scientific methods with the most popular of them concerning the application of the transportation problem model. Considering the specific needs of each particular economic system, a modification of that model is presented in this paper, accounting both indicators – transportation time and transportation costs. In order to demonstrate the effect of the application of the model, an approbation with exemplary numerical data is given.
25.	10.	*Milkova, T. (2019). Some Simple Interest Models. // Mathematics and Informatics, № 2, Sofia: Az Buki, pp. 229-236.* In this paper some aspects of financial mathematics and in particular some problems for simple interest are examined. As we know, the classical formula for simple interest is based on the assumption for constant initial investment and constant interest rate. The present study is mainly methodological and it examines three additional simple

		interest models – constant investment and variable interest rate, variable investment and constant interest rate, variable investment and variable interest rate. Some formulas are outlined – they can be used for educational purposes and for solving practical problems.
26.	11.	*Milkova, T. (2019). Opportunities for Classifying the Material Stocks by Several Criteria. // Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series, 8(2), p. 11-20.* One of the key factors for ensuring the achievement of business aims is related to the proper inventory management in the logistics system. Before moving on to the selection of appropriate methods for optimal management of each specific stock type, it is necessary to classify the whole nomenclature in order of importance according to certain criteria, most often using the methods of analysis ABC and XYZ. Subsequently, appropriate management methods are applied to each of the stock groups. In the specialized literature, the classification of the material stocks by one criterion or the sequential classification of each group by several criteria is most often considered. The present study proposes an approach for constructing an integral nomenclature classification criterion that simultaneously considers the impact of several criteria.
27.	12.	*Milkova, T. (2019). Various Methods for ABC Analysis of Inventory in MS Excel with Examples. // Serdica Journal of Computing. Volume 13, Number 3-4, p.183-196.* The technologies in IT industry play an important part in all areas of business and education in the contemporary world. It is hard to imagine most of the activities going smoothly without computers and software. The purpose of this paper is to present an idea for inventory ABC analysis. A sample dataset is used. A classification of inventory by empirical and graphical method in MS Excel is carried out. The application of ABC analysis in inventory management leads to a differentiation of inventories into three groups – the most essential, the least essential for the activities of the organization and all between them. Depending on the level of importance of the inventories, different approaches for their management are recommended. This leads to the need to optimize logistic costs. The proposed approach can be used in the educational processes for students and also for real practical applications in inventory management in logistics.
28.	13.	*Grozdev, S., R. Nikolaev, T. Milkova (2020). Analysis of the Problems and the Performance of the 11th and 12th Grade Students in the XIX Mathematical Tournament "Perperikon" // Mathematics and Informatics, № 1, Sofia: Az Buki, pp. 67-77.* The paper presents the problems for XI and XII grades from the 19th Mathematical Tournament "Perperikon", held in the city of Kardzhali on November 30, 2019. Methodological solutions of the problems are proposed. An analysis of the results achieved by the participants is done

		and the level of their preparation for such type of mathematical competitions is assessed.
29.	14.	*Nikolaev, R., Milkova, T. (2020). One Model of a Linear-Fractional Three-Index Transportation Problem. // Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series, 9(1), pp.129-136.* In specialized literature and in practice some methods for production-transportation planning using the models of three-index transportation problem are well-known. Different linear-fractional models for production-transportation planning are applied as well. In the present paper the authors aim to combine elements of the three-index transportation problem and elements of the linear-fractional optimization, thus offering a model of three-index transportation problem with a linear-fractional function which combines the advantages of both methods and gives better opportunities for determining an optimal solution and making the post-optimal analysis.
30.	15.	*Milkova, T. (2020). Risk management by options strategy hedging. // Mathematics Plus. Sofia: Archimedes, № 4, pp. 66-79.* The rational management of financial resources is the foundation of each economic activity. It concerns the application of various mathematical and statistical methods that build people‘s financial literacy. It is of crucial importance that these methods are studied by pupils and students. This article presents some basic elements of the mathematical material related to risk hedging by options strategy and proposes a methodology for teaching this material with the help of modern IT technologies.
31.	16.	*Nikolaev, R., T. Milkova (2021). Some possibilities to apply mathematical tools in optimal investment choice. // Mathematics Plus. Sofia: Archimedes, № 1, pp. 88-95.* Investing is a process of a crucial importance in the field of economics, as it concerns the possibility of increasing existing money capital. However, this process is closely related to the need of performing some preliminary calculations and analysis in order to select the best investment option. There are some mathematical tools that allow determination of optimal option for investing a certain amount of money but it must be understood and applied correctly in order to receive expected results. Some aspects of these mathematical tools are discussed in the present paper, accenting not only on the presentation of the right approach for optimal investment choices but also on the methodology of its application.

32.	17.	*Nikolaev, R., T. Milkova (2021). Essence and features of term deposits for fixed periods. // Mathematics Plus. Sofia: Archimedes, № 3, pp. 74-84.* The availability of extra financial income often leads to a desire and/or need to realise savings. The saving process is a long-term financial operation, which is well-known in financial mathematics as "term deposit for a fixed period". It is an important aspect of financial literacy. Effective knowledge of financial calculations related to term deposits for fixed periods could be crucial when deciding to realise savings or looking for other alternatives in governing extra financial income. Skilful applying of mathematical methods in the construction of term deposits for fixed periods could be useful to pupils and students for their participation in various mathematical Olympiads and competitions with a financial focus. The related knowledge could be also useful to teachers and people needing similar financial instruments. This paper deals with both the essence of term deposits for fixed periods and some methodological characteristics in studying and applying corresponding calculations.
33.	18.	*Nikolaev, R., Milkova, T. (2021). Two-Dimensional Problem for Using the Resources with Inconstant Expense Rates. Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series, 10(1), pp.141-148.* The model of using the resources optimally is a well-known one in the theory of linear optimization. It provides an opportunity for determining an optimal production plan for a certain number of products based on given cost rates of each resource to produce one unit of each product, given stock quantities of raw materials used and given prices of the final products. In the present paper an opportunity to determine the optimal production plan is revealed if some of the cost rates are not fixed but depend on a parameter. The methods of parametric linear optimization are used, demonstrating options to apply the graphical method for solving a two-dimensional problem for using the resources.
34.	19.	*Nikolaev, R., T. Milkova (2022). Two-parametric problem for optimal distribution of resources. // Mathematics and Informatics, № 1, Sofia: Az Buki, pp. 96-111.* The methods of linear optimization are well-known, both in the literature and practice, as one of the most effective methods for optimizing economic phenomena and processes. Linear models with determined coefficients have been thoroughly studied so far, but there are still areas in which research related to parametric linear optimization models can be further developed and improved. In the present paper, the graphical method for solving a two-factor linear optimization problem is used to analyze the solution of a problem for optimal distribution of resources with two parameters in the coefficients multiplying the variables in one of the constraints.

35.	20.	*Nikolaev, R., T. Milkova (2022). One application of the graphical method for solving parametric problems for optimal allocation of resources. // "Izvestia", № 2, Varna: Science and Economics, pp. 155-169.* One of the most appropriate methods for achieving optimal economic results are the methods of linear optimization. A well-known problem in the literature and practice is the one for optimal allocation of resources, which provides maximum profit from the production of certain products. In many practical situations it is possible that some of the input parameters are not completely determined but may vary in certain limits. This leads to the so-called parametric problem, which is presented in the specialized literature, but in some very limited cases in terms of the presence of parameters in the input data. The present paper considers an opportunity to perform a thorough analysis of the problem for optimal allocation of resources in the case of parametric change, both of the coefficients in the constraint conditions and of the coefficients in the objective function. The potential of the graphical method is used to find an optimal solution to the problem for allocation of resources.
36.	21.	*Nikolaev, R., T. Milkova (2022). Sixth International Olympiad in Financial and Actuarial Mathematics. // Mathematics Plus. Sofia: Archimedes, № 1, pp. 76-83.* The International Olympiad in Financial and Actuarial Mathematics for students and citizens was held for the sixth consecutive year on 11.12. 2021. This article presents the problems of the Olympiad, their solutions, the participation of different countries and the achieved results.
37.	22.	*Milkova, T. (2022). Dynamic model for inventory management with variable consumption rate. // "Izvestia", № 4, Varna: Science and Economics, pp. 376-392.* In the theory of scientific inventory management many models are known that optimize the cost of inventory management in various circumstances, mainly related to the nature of inventory consumption. Some of the fundamental dynamic models are designed for the case of a steady rate of consumption and are well known as Wilson models. They have a few advantages, but also several restrictions in building the model, which means that they are not suitable for direct application in each practical situation. Although some modifications of these models are well known in the literature, there are still some directions in which they can be developed to be practically more useful. The aim of the present study is to construct a model of inventory management at a variable rate of consumption based on Wilson models. On the next step a method for solving this model and its specific approbation is proposed to achieve minimal total costs of inventory management.

38.	23.	*Nikolaev, R., T. Milkova, Y. Petkov (2022). Olympiad in financial mathematics for university students. // Mathematics Plus. Sofia: Archimedes, № 4, pp. 78-85.* What are presented are the paper, solutions of the problems and the results of the Olympiad in Financial mathematics for university students held in November this year. The Olympiad was organized as youth initiative by Varna Municipality and the Department of "Statistics and Applied Mathematics" at the University of Economics, Varna.
39.	24.	*Milkova, T. (2022). A Stochastic Inventory Management Model with Consideration of Additional Information. Izvestia Journal of the Union of Scientists - Varna. Economic Sciences Series, 11(1), pp.167-174.* Proper management of stocks in the logistics system is essential for achieving high economic performance of any economic organization in the modern economy. The choice of appropriate models and methods for effective stock management depends on the nature of their consumption. In general, two main types of inventory consumption are considered – in certain and in case of random demand. In literature, a fundamental model for the management of stocks in random demand is known, using probability characteristics for the consumption of a certain quantity of the stock. These values are often difficult to set completely correctly. The article offers an opportunity to overcome these difficulties by constructing an algorithm to determine them taking into account additional information about the environment.
40.	25.	*Nikolaev, R., T. Milkova, V. Yordanova (2023). Some features of loan repayments. // Mathematics Plus. Sofia: Archimedes, № 1, pp. 94-103.* The lack of sufficient personal financial resources is related to loan (credit) taking needs. This requires a repayment schedule for the corresponding loan repay. Two main methods of loan repayments are known – with equal repayments of the principal or equal monthly payments. Each of them is connected with different features. The aim of the present paper is to examine some peculiarities and summarize some conclusions related to the preparation of repayment schedules for loan taking.
41.	26.	*Nikolaev, R., T. Milkova, V. Yordanova (2023). A type of problems for deposits on simple interest. // Mathematics Plus. Sofia: Archimedes, № 3, pp. 67-75.* Deposits are formed when individuals and legal entities deposit amounts in bank accounts. Usually, interest should be charged on the deposited amounts. In the theory and in practice some specific situations in deposit management are possible. The present paper studies some features for deposits with simple interest.

42.	27.	*Nikolaev, R., T. Milkova, Y. Petkov, V. Yordanova (2023). Olympiad in financial mathematics for university students' 2023. // Mathematics Plus. Sofia: Archimedes, № 4, pp. 65-71.* Some details are presented about the organization of the Olympiad in Financial Mathematics for University Students' 2023. Methodological solutions of the problems from the Olympiad paper are proposed.
43.	28.	*Nikolaev, R., T. Milkova (2024). Application of some formulae for sums in financial calculations. // Mathematics Plus. Sofia: Archimedes, № 1, p. 80-87.* Solving problems in Financial mathematics is often associated with the application of various mathematical formulae and methods. The present paper considers some applications of formulae for sums in specific financial problems.
44.	29.	*Nikolaev, R., Milkova, T. (2024). One feature in the assessment of investments in a recession. Stroitelno predpriemachestvo i nedvizhima sobstvenost = Construction Entrepreneurship and Real Property, 1 (1), pp. 15-25.* The availability of free funds in the economy is usually associated with the investment process. In the specialized literature, various methods for assessing investments are known, but one of the fundamental methods of assessing investments is related to the calculation of the NPV (Net Present Value) indicator. According to the generally accepted rule, an investment is profitable if there is an NPV greater than zero. A negative NPV indicates that the investment is loss-making and should be rejected. However, this rule is derived under certain conditions. This paper shows a peculiarity in the assessment of investments related to the fact that in conditions of recession there are situations in which an investment with a negative NPV can be accepted. The article uses financial mathematics methods, in particular formulas for accruing interest and discounting future cash flows. Three options are considered in the presence of free cash – to keep it at home, to deposit it on a bank and to invest. Through concrete examples, it has been shown that in conditions of low deposit interest rates and high bank account service fees, it is possible that an investment with a negative NPV would be preferable, which refutes the generally accepted claim in theory.

IV. Scientific papers

№	Group number	Title
45.	1.	*Milkova, T., V. Yordanova (2014). Solving multi-stage tasks for resource allocation in MS Excel. Proceedings of the International Scientific Conference "Information Technologies in Business and Education". Varna: Science and Economics, pp. 411-420.* One of the main classes of operational tasks widely used in the optimization of some economic processes are multi-stage tasks for resource allocation, in which discrete processes are observed. They are well developed theoretically and methods for finding their optimal solution are known, which, however, are associated with labor-intensive computational procedures. This report proposes a method for determining the optimal solution of this class of operational problems using the Solver tool in MS Excel.
46.	2.	*Nikolaev, R. N., Milkova T. V. (2014) The problem of allocating resources with relative parameters. "Ukraine – Bulgaria – European Union: Current State and Prospects". Materials of the international scientific and practical conference. Volume 2 – Kherson – Varna: Kherson, pp. 255-259.* The continuous search for opportunities to identify the optimal solutions for the management of economic processes and systems is one of the prerequisites for the rational economic subjects to cope with the challenges of a highly competitive market environment. An effective choice for making optimal management decisions is associated with the application of science-based approaches, often related to the need of adapting various mathematical models, which describe economic phenomena and processes. There are various classes of operational tasks in specialized literature, which are well-developed both in terms of theory and application, the usage of which could lead to better economic performance. One of these classes of operational tasks is represented by the multi-stage tasks for resource allocation in discrete processes. The goal of the authors of this paper is to offer a modification of the multi-stage task for allocating resources in discrete processes, which helps optimize the target function, which takes into account the relative income derived from the investment of a certain number of resource units at the given stages, as well as to demonstrate the effect of the application of this model on the basis of a specific numerical example.
47.	3.	*Nikolaev, R., T. Milkova (2014). Converting a multi-stage resource allocation task into a linear optimization task. Proceedings of the Tenth International Scientific and Applied Conference "Economics and Management of Innovations – Modern Theories and Practices". Varna: Largo City, pp. 230-237.* If it is necessary to optimize some economic processes, it is advisable to apply different classes of operational tasks. One type of operational task

		is multi-stage resource allocation tasks, in which discrete processes are observed. Although they are well developed theoretically and methods for finding the optimal solution are known, these methods are associated with labor-intensive computational procedures. This report offers one possibility to reduce the multi-stage task of resource allocation to a linear optimization problem, which is not difficult to solve.
48.	4.	*Nikolaev, R. N., Milkova T. V. (2015) Opportunities for anuietteni calculation in conditions for competition. "Ukraine – Bulgaria – European Union: Current State and Prospects". Materials of the international scientific and practical conference. Volume 1 – Kherson – Varna: Kherson, pp. 276 – 280.* This report proposes some options for flexible lending based on the application of mathematical methods. Based on an existing model for calculating standard annuity installments, some modifications are proposed, allowing for flexibility in the field of lending conditions. A comparison is made between the proposed options, outlining the main advantages and disadvantages of each of these options.
49.	5.	*Nikolaev, R., D. Zhelyazkova, T. Milkova (2017). Modeling of optimal structure of the passengers transport in Bulgaria. // 4rd International multidisciplinary scientific conference on social sciences & arts SGEM 2017, 24-30 August 2017 Albena, Bulgaria: conference proceedings - Book 1. Modern science. Economics & Tourism, Volume IV, Albena, Bulgaria, pp. 525-532.* Economically justified solutions concerning the European transport system are crucial for the competitiveness of the Alliance throughout the World, for the financial growth, for reducing the unemployment and for improving the standards of living. It is exactly the free movement of people across the borders which is one of the four types of freedom typical for the European citizens, together with the free transportation of goods, services and capital. For realizing the mobility of its citizens each country creates preconditions for development of a variety of transport alternatives incl. bus, railway, waterway (maritime, inland waterways) and air transport. In the present research paper an attempt has been made for modeling optimal structure of the passengers transport aiming the maximization of the total transportation costs from each mode of transport for a certain interval of time, measured in total kilometers for total number of passengers. Using the methodology of Mathematical Modeling a non-linear mathematical model is constructed and it is transformed into linear in terms of its easier calculation. The created and tested model of the problem for optimizing the total transportation amount from the passengers transport in Bulgaria for the period 2008-2015 is a good empirical base for realizing a row of experiments with different time range and forecasting lag, which can be applied successfully at international, national and regional level. Its potential allows the forecasting in a comparative order with real data to

		serve in the future for approving or rejecting of hypotheses with tactical significance. The forecasted values of the indicators for the total transportation amount from each mode of transport in Bulgaria are a good base for defining basic conclusions in comparative order with the anticipated expectations for the development of the transport sector in the European Union.
50.	6.	*Nikolaev, R., T. Milkova, D. Zhelyazkova (2017). Minimizing the transportation costs by optimal positioning of units in logistics systems. // 4rd International multidisciplinary scientific conference on social sciences & arts SGEM 2017, 24-30 August 2017 Albena, Bulgaria: conference proceedings - Book 1. Modern science. Economics & Tourism, Volume IV, Albena, Bulgaria, pp. 509-516.* The present research paper deals with the problem for determining the optimal positioning of units in logistics system aiming the minimization of the transportation costs for providing communication between the units. For the purposes of the research a logistics system is treated as relatively stable set of units (structural and/or functional subunits of the company but also suppliers, consumers and logistical mediators) connected to each other and united in one management of the logistical process for realizing the corporative strategy of the business organization. Basic task of the management of logistics systems is providing minimal expenses for all the processes, one of which is concerning the positioning of the interconnected units. When determining the optimal positioning of the units in logistics systems must be taken into account a variety of factors, one of which is dealing with the transportation costs depending on the distance between the interconnected units. Usually when determining the optimal positioning of units an approach is applied when choice is made between certain quantity of options taking into account specific factors – production expenses, transportation costs etc. In the present paper another type of optimization is proposed, using the instruments of the analytical geometry. On that base the units of the logistics system are treated as points in Cartesian coordinate system. A non-linear model for optimization is constructed and an analytical method for its solving is proposed based on the famous Heron's problem. By this model the coordinates of the points at which to position the units to minimize the total distance between interconnected units are found taking into account certain restrictive conditions.

51.	7.	*Nikolaev, R., T. Milkova (2017). An approach to optimizing the positioning of units in logistics systems. Proceedings of the VIII International Scientific Conference "The Economy in a Changing World: National, Regional, and Global Dimensions", University of Economics – Varna, Varna: Science and Economics, vol. 1, pp. 123-129.* According to the most widely accepted definitions of the term logistics system, it is a relatively constant set of units (structural and/or functional subdivisions of the company, as well as suppliers, customers and logistics intermediaries) interconnected and united by single management of the logistical process for the realization of corporate strategy of business organization. The main task of the management of logistics systems is to ensure the minimum cost of all the activities, one of which is related to the positioning of interconnected units. In determining the optimal positioning of the units in logistics systems we should take into account a number of factors, the main of which is related to transport costs, depending on the distance between interconnected units. In there earlier studies both authors examine in depth issues related to optimum positioning of units in logistics systems. There, however, an approach is chosen from a number of possible ones seeking for optimal positioning units, taking into account specific factors - production costs, transport costs and others. In this paper another type of optimization is applied, where units in the logistics system are treated as points in Cartesian coordinate system based on sets of analytic geometry and the coordinates of the points at which to position the units to minimize the total distance between interconnected units are found taking into account certain restrictive conditions.
52.	8.	*Nikolaev, R., D. Zhelyazkova, T. Milkova (2018). Minimizing the transportation costs by means of three dimensional transportation problem. // 5rd International multidisciplinary scientific conference on social sciences & arts SGEM 2018, 26 August – 01 September 2018 Albena, Bulgaria. Conference proceedings – Issue 1.4, Modern science, Economics and Tourism, Volume 5, pp. 549-556.* In the present paper some possibilities for construction and application of various modifications of the well-known transportation problem are proposed aiming the minimizing of the transportation costs for transferring the material flows between suppliers and consumers. The transportation costs are usually a significant part of the total logistical expenses and each logistic system has its own specifics and characteristics for transportation of materials, goods and products. This gives opportunities for applying different optimization models and methods which concern most of all the particular characteristics of each economic situation. In the well-known classical model of the transportation problem the optimal distribution of the transport is determined but not the timing of the delivery. In the present research paper the authors make an attempt to construct a three dimensional transportation problem with the third dimension is the moment of delivery and an optimal solution is

		determined for the transport between suppliers and consumers for a given period of time. Some modifications of the model are examined which differ in some characteristics of the problem with a reflection in the constraints. The methods of the linear optimization are used during the construction of the model of three dimensional transportation problem for minimizing the transportation costs.
53.	9.	*Milkova, T., V. Yordanova (2018). A model for determining an optimal plan for the transportation of material flow. Proceedings of the Eleventh International Scientific and Practical Conference "Digital Economy and Blockchain Technologies", Varna: Largo City, pp. 338-344.* The conditions of the global digital economy lead to the expansion of the borders in which the production and trade of each product takes place. The need to physically transport material flows from raw material sources to production plants and from them to final users is associated with significant costs, as transport distances are already taking on significant dimensions. With this in mind, this report proposes an economic-mathematical model for determining an optimal plan for the transport of material flow under specific restrictive conditions.
54.	10.	*Nikolaev, R., T. Milkova (2018). Optimizing the transportation costs by means of multi-product transportation problem. Proceedings of the International Scientific Conference "Commerce 4.0 – Science, Practice and Education". Varna: Science and Economics, pp. 316-324.* In the present paper some possibilities for construction and application of various modifications of the well-known transportation problem are proposed aiming the minimizing of the transportation costs for transferring the material flows between suppliers and consumers. The transportation costs are usually a significant part of the total logistical expenses and each logistic system has its own specifics and characteristics for transportation of materials, goods and products. This gives opportunities for applying different optimization models and methods which concern most of all the particular characteristics of every economic situation.
55.	11.	*Nikolaev, R., T. Milkova (2018). A model for optimal choice of suppliers of goods and materials. Proceedings of the International Scientific and Practical Conference "Industrial Business and Entrepreneurship – Innovations in Science and Practice". Varna: Science and Economics, pp. 89-98.* The effective functioning of each supply chain is determined by the optimal fulfilment of all key business processes with one of them concerning the management of all the relations with suppliers, including logistic activities like determining the needs of material resources, choice of suppliers and specifying the quality of supply. In the specialized literature some economic-mathematical models for optimal choice of suppliers are proposed where the main criteria for optimality are

		minimizing the transportation costs, minimizing the supply organization costs, optimizing the supply reserves storing costs etc. In the present paper an economic-mathematical model for optimal choice of suppliers is sug-gested from point of view of minimizing the expenses for buying goods and ma-terials.
56.	12.	*Nikolaev, R., T. Milkova (2018). Some possibilities for refunding long-term mortgage loans. Construction Entrepreneurship and Real Property: Conference Proceedings, Varna: Science and Economics, pp. 50-59.* Nowadays there is an increase in the relative part of houses bought by mortgage loans. This leads as a consequence to a stronger competition between the credit institutions and also to a steady growth in the specific needs and preferences of the clients of these institutions. Based on this, there is more and more a necessity for some flexible politics from bank institutions, which may lead to increase of their part from the mortgage loans market and also to guarantee a higher level of serving their clients. In the present paper, based on analysis of the existing methods for refunding home mortgage loans, the authors propose a methodology for adapting the amortization schedules to new options.
57.	13.	*Nikolaev, R., T. Milkova (2019). Model for inventory optimization in a construction enterprise. Construction Entrepreneurship and Real Property: Conference Proceedings, Varna: Science and Economics, pp. 40-48.* One of the main factors for ensuring high economic results and achieving the set business goals is related to optimal inventory management in the logistics system. There are many science-based approaches in the specialist literature aimed at minimizing the costs associated with inventory in an organization. Most of these methods are universal in nature and do not take into account the particularities of the organization's activities. This report proposes a modification of Wilson's classic inventory management model, which addresses some of the specifics of inventory in a construction enterprise.
58.	14.	*Milkova, T. (2019). ABC analysis of inventory in MS Excel. // International Conference „Information and communication technologies in business and education". Conference proceedings. Varna: Science and economics, pp. 155-165.* The technologies in IT industry take important part in all the areas of business and education in the contemporary world. It is hard to imagine for most of the activities to go smoothly without computer. In the present paper an idea for an inventory ABC analysis is revealed. The proposed methodology can be used in the educational processes for students and also for real practical applications in inventory management in logistics.

59.	15.	*Zhelyazkova, D., T. Milkova (2019). A Model for Optimizing the Structure of Bulgarian Transport in Accordance with the Environmental Goals of the EU. Scientific proceeding of The First Scientific and Business Conference in Logistics and Supply Chain Management "The Knowledge of Logistics and Supply Chain Management in Bulgaria: Education, Business, Science", Sofia: Publishing Complex – UNWE, pp. 147-159.* Environmental problems stand out for their relevance and are emphatically significant for the transport sector of the European Union, and in particular of Bulgaria. The present study aims to construct an economic and mathematical model that will determine the optimal structure of the transport system of Bulgaria, in accordance with the strategic goals of the European Union for sustainable development of the sector and the economy as a whole. In order to achieve this goal, an economic and mathematical model has been constructed and tested and its modification in order to reveal opportunities for improving the indicators related to harmful emissions, depending on the work done by the different modes of transport. In conclusion, it is concluded that in order to comply with the EU recommendation and to maintain all harmful emissions at the levels reported in 2005, the structure of Bulgarian transport should be close to the one reported this year.
60.	16.	*Nikolaev, R., T. Milkova (2020). Some features in the field of financial mathematics. Conference proceeding "Pedagogy of Education in Mathematics and Informatics", Archimedes and Diogenes Institute for Educational Policies. Sofia: Alliance Print, pp. 193-201.* Increasing the financial literacy of the population is one of the most important problems in the society today. This paper treated a small range of problems such as: the features of calculating the percentage change of a given quantity in a dynamic environment; the pricing of a commodity; inflation rate; the real and nominal interest rate; the difference between the relative and the conforming interest rate. A number of examples are offered to better understanding of the presented models.
61.	17.	*Nikolaev, R., T. Milkova (2020). One model for optimal distribution of human resources for different activities. Jubilee International Scientific Conference „Economic Science, Education and the Real Economy: Development and Interactions in the Digital Age“, Vol. II. Varna: Science and Economics, pp. 253-261.* In the present paper the human resources distribution problem for carrying various activities in a particular organisation is examined. An economic-mathematical model is presented, which determines the optimal total productivity considering different individual productiveness of workers and employees during each particular activity. Different options for restrictions and constraints in the number of human resources distributed for every activity are proposed, as well

		as for the number of activities, which can be assigned to one worker or employee.
62.	18.	*Nikolaev, R., T. Milkova (2020). Special Features of Constructing Numbers in Roman Numerals. Proceedings of the Anniversary International Scientific Conference "Synergetics and Reflection in Mathematics Education". Plovdiv: University Publishing House "Paisii Hilendarski", pp. 129-134.* The paper treats the topic of Roman numerals. Some opportunities for their application in the contemporary world are presented. Certain rules for constructing numbers in Roman numerals are revealed as well as some skills for converting the latter to Arabic numbers. All theoretical facts are based on numerical examples. The paper aims pedagogical results and contributes well to the theory of Roman numerals, as well as to their applications for solving particular problems.
63.	19.	*Nikolaev, R., T. Milkova (2020). One model for optimal distribution of construction materials from suppliers to consumers. Construction Entrepreneurship and Real Property: Conference Proceedings, Varna: Science and Economics, pp. 40 – 46.* One of the activities in which optimal solutions should be applied is related to modelling the movement of material flows. In this regard, it is essential to distribute them correctly from suppliers to consumers, in order to minimize transport costs, minimize production costs, ensure security of supply etc. The present study proposes a modification of the model for distribution of material flow from suppliers to consumers, adapted for the supply of construction materials, taking into account some specifics of this activity.
64.	20.	*Milkova, T. (2020). One aspect in teaching students financial literacy. Conference proceeding "Pedagogy of Education in Mathematics and Informatics", Archimedes and Diogenes Institute for Educational Policies. Sofia: Alliance Print, pp. 200-209.* Financial literacy is an essential part of the educational process in modern societies. It includes a wide range of knowledge, both of a number of concepts and of appropriate tools for optimal decision-making in this field. One aspect of financial literacy is related to the ability to manage investments properly and minimize the risk. The acquisition of such skills is important for the education of students, as the investment process can be performed not only by companies and organizations, but also by individual citizens, if they have spare financial resources. This paper treats some key methods of approach related to investment risk minimization options. The presented methods aim to build the foundations of students' financial literacy on the issues considered.

65.	21.	*Nikolaev, R., T. Milkova (2021). An opportunity for optimal choice of the location for industrial object construction. Construction Entrepreneurship and Real Property: Conference Proceedings, Varna: Science and Economics, pp. 64 – 69.* The problem of optimal location of new buildings (administrative, commercial, warehouses, logistics centers, etc.) is crucial in terms of providing the future users with easy access to them. Some methods for determining the optimal location are well-known in the literature but they are mostly based on the distance from the corresponding building to the user who intend to visit it. This paper reveals an opportunity to choose a location for the construction of a new building, which is realized with the help of models from game theory. The characteristic feature of this model is that the determination of the optimal location depends on the interest of the consumers as users (clients) of the object of preferred location.
66.	22.	*Milkova, T. (2021). Opportunities for classifying the material stocks by two criteria. Innovations and Good Practices in Logistics and Supply Chain Management: Proceedings of the Second Scientific and Business Conference on Logistics and Supply Chain Management. Sofia: Publishing Complex – UNWE, pp. 145-155.* One of the key factors for ensuring the achievement of business aims is related to the proper inventory management in the logistics system. Before moving on to the selection of appropriate methods for optimal management of each specific stock type, it is necessary to classify the whole nomenclature in order of importance according to certain criteria, most often using the methods of analysis ABC and XYZ. The application of these methods involves the usage of classification criteria for total value of stocks or the ability to forecast stock needs accurately. This report puts a stress on the possibility and benefits of applying a classification method using two significant criteria - stock value and delivery time for the next batch of stocks.
67.	23.	*Nikolaev, R., T. Milkova (2021). Some featurers in the study of basic elements of statistics in the new curricula in mathematics for 12. Grade in general education. Conference proceeding "Pedagogy of Education in Mathematics and Informatics", Archimedes and Diogenes Institute for Educational Policies. Sofia: Alliance Print, pp. 166-173.* According to the last amendments in the mathematics curricula in some grades, the range of knowledge and skills that students should acquire has been expanded. One of these amendments concerns the implementation of the study of basic elements of statistics. In this paper, attention is focused on the study of the concepts of general aggregate and a representative sample in Mathematics for general education in 12th grade. The aim of the authors is to suggest a methodology for determining the optimal number of units (n) in the sample, in order to minimize the error in evaluating the parameter "relative frequency" in

		the general aggregate, and this methodology is not in conflict with the existing theoretical research on the problem, but only helps for better and easier comprehension by students and acquisition of skills for its application.
68.	24.	*Milkova, T. (2022). Importance of fundamental mathematics training when studying quantitative methods in logistics. Conference Proceeding "The Role of Fundamental Programs in Higher Education". Varna: Science and Economics, pp. 61-70.* Mathematics training in the foundation of higher education in economics is essential in view of this, to create prerequisites for the possibility of learning and skills for the handling of students, with different concepts and methods from the special and specialized disciplines in each specialty. This report will address several key elements of the Applied Mathematics curriculum that are directly related to some of the models and methods being studied under Quantitative Methods in Logistics and which, without fundamental mathematics preparation, will not be absorbed by students at the required level.
69.	25.	*Nikolaev, R., Milkova, T. (2022). Application of game theory to choose an optimal stock management strategy. Conference Proceeding "Logistics in Time of Crisis: Challenges and Solutions". Varna: Science and Economics, pp. 130-137.* Choosing optimal stock management strategies is a complex and labor-intensive process related to the need to summarize a large amount of information, choose an appropriate method and perform specific computational procedures or choose the appropriate software to solve the problem. These activities are essential as stocks in the logistics system involve large amounts of funds and their management also involves significant financial costs. This study looks at an opportunity to apply a game theory model that enables to determine an optimal strategy for the management of stocks that are of a random nature of consumption. The proposed game model is easy to use for real practical use as it involves using only easy-to-determine parameters expressing different cost components and can be used instead of the classic random search stock management model.
70.	26.	*Nikolaev, R., T. Milkova (2022). Analysis of the formation of annuity contributions for mortgage loans. Construction Entrepreneurship and Real Property: Conference Proceedings, Varna: Science and Economics, pp. 43-48.* The various problems related to financial calculations are of great importance for the economic stability of all economic operators. One key element in this regard relates to determining the amount of repayments when withdrawing a loan. Borrowing (credit) is one of the most popular financial transactions and is undoubtedly present in the lives of most people in modern society. The most commonly used loans

		are consumer and mortgage. The report looks at long-term mortgage loans and ways of charging interest, not taking into account different fees set by banks. An analysis of the positive and negative parties was carried out when calculating the constant installment (annuity) for repayment of a long-term loan.
71.	27.	*Nikolaev, R., T. Milkova (2022). Some pedagogical approaches to teaching mathematics for economists. International Scientific Conference IMEA'2022, 23-25 November 2022 Pamporovo, Bulgaria, pp. 289-296.* Traditionally, mathematics is difficult to understand for a large number of students, especially those who study mathematics as an auxiliary tool for mastering special disciplines. In order to properly understand and master mathematical concepts that often seem too abstract to students, different pedagogical approaches need to be applied. This report presents some methods of teaching mathematics to economists, which are based on explaining the essence of mathematical concepts through real economic examples.
72.	28.	*Nikolaev, R., T. Milkova, J. Petkov, V. Yordanova (2023). The Accuracy of calculations in financial mathematical problems. The post-Soviet space is a territory of innovations. Collection of the 7th International Scientific and Practical Conference, Moscow: Moscow Regional Socio-Economic Institute, pp. 223-232.* In the last two or three decades, special attention has been paid to the financial literacy of teenagers - schoolchildren and students. A special impression when considering and evaluating the solutions to the tasks of the participants is that the calculations show insufficient accuracy, which leads to inaccuracy of the results, both in numerical values and as conclusions that need to be drawn. The goal set by the authors in this report is to demonstrate the effect of inaccurate rounding in calculations based on some examples from the main topics included in the material on the Olympiads in financial mathematics.
73.	29.	*Nikolaev, R., T. Milkova (2023). Features of the choice of method of valuation of investments. Conference Proceedings "Industrial Business – Perspectives and Opportunities". Varna: Science and Economics, pp. 145-152.* The possibility of increasing the available monetary capital provided by the investment process defines it as particularly significant in the economy. The investment process is always related to preliminary analyzes and calculations on the basis of which to choose the optimal investment option. The theory proposes a special mathematical apparatus on the basis of which to determine the optimal option for investing some amount of money. In its application there are a number of peculiarities. The report presents some peculiarities in the selection of a suitable mathematical apparatus for the evaluation and comparison

		of investments, as well as the problem of training students in economics of these methods.
74.	30.	*Nikolaev, R., T. Milkova, R. Miryanov (2024). Application of mathematical methods for constructing a two-factor economic model. Conference Proceeding "The Role of Fundamental Programs in Higher Education". Varna: Science and Economics, pp. 11-17.* In the field of economic science and its manifestations, there is almost no creation of scientific knowledge without the participation of fundamental knowledge in mathematics. A number of branches of mathematics such as linear algebra, analytical geometry, financial mathematics, differential and integral calculus, probability theory, statistics, game theory, mass service theory, stock theory, risk theory and many others are widely used. The aim of this paper is to investigate a two-factor model by applying knowledge of differential calculus of two variables and the method of least squares.
75.	31.	*Nikolaev, R., T. Milkova, V. Yordanova (2024). Some mistakes in the formulation and setting of tasks by students. The post-Soviet space is a territory of innovations. VIII International Scientific and Practical Conference: Reports and Messages: [Electronic resource]: Conference Materials / Under the general editorship of Prof. B. K. Tebiev. – Moscow: Znaniye-M, pp. 296-301.* The article examines three geometric problems that can be solved without careful study. The bottom line is that three tasks are set incorrectly, and these elements do not exist for such figures.

V. Textbooks

№	Group number	Title
76.	1.	*Atanasov, B., R. Nikolaev, T. Milkova, D. Mihaylov (2015). Operations Research. Varna: Science and Economics. Chapters Two (pp. 60-139), Fourth, Fifth, and Sixth (pp. 171-263).* The textbook "Operations Research" is dedicated to presenting the basic principles of operational research in economics, with an emphasis on a large part of the theoretically and applied classes of operational tasks. It is intended for students studying in the EQD of Bachelor and Master at the University of Economics – Varna, studying the discipline "Operations Research". Given the comprehensiveness of the content of the textbook, we believe that it can serve as a basis for both students of economics and representatives of economic practice, interested in applying mathematical methods for making optimal economic decisions. The authors' desire for the content of the proposed textbook on "Operations Research" to be accessible and understandable to a wide range of readers is expressed in their desire to simplify the otherwise

		complex mathematical apparatus related to the need for knowledge in a wide range of mathematical disciplines. In this regard, a number of mathematical statements have been made without their proofs, and those of the proofs that have been presented have been greatly simplified. In addition, when presenting the mathematical apparatus in a number of places, the possibility of its application on the basis of specific numerical examples has been demonstrated.
77.	2.	*Rosen Nikolaev, Radan Miryanov, Tanka Milkova (2020). Applied Mathematics. Publishing House "Science and Economics", 262 p.* This book is addressed to students from the University of Economics – Varna in undergraduate programs in English. Its content corresponds to the curriculum and is structured in seven sections. As the book is written for students in economics, the theoretical conclusions are minimized. In contrast, great attention has been paid to the applications of mathematics in the modeling of economic processes. The slightly elevated degree of abstraction cannot be avoided in some of the topics, such as the first chapter. Students usually do not understand why matrix operations or determinant calculations should be studied. This knowledge though is applied in analytic geometry, which methods present an option for the construction of visual economic models. It is also applied in optimization methods, that remain outside the scope of this course but are an extremely important part of the mathematical applications in economics. Indefinite integrals also appear to be abstract and not very applicable in economics. However, they play an important role in the calculation of definite integrals. These definite integrals are used for the analysis of economic categories such as consumer and producer surplus, the calculation of the Gini coefficient, as well as in the study of statistical distributions. The matter of modern economic theory is the behaviour of the economic subject in order to maximize the income in circumstances of scarcity of resources and limitless needs. From one point of view, this means we choose what amount of money to invest in order to get the maximum profit. On the other hand, this may mean getting some profit, but with minimal invested resources. Translated into a formal, mathematical language, in the first case we search for the maximum and in the second – for the minimum. In conclusion, we would like to remind that in economics, numbers express real quantities of goods, labour standards and money. The success of the business, the profit of the company, the salaries of the managers and the employees as well as the well-being of their families depend on their correct assessment and calculations.
78.	3.	*Nikolaev, R., Surujon, D., Stoyanov, T., Zapryanova, T., Milkova, T., Miryanov, R. (2021). Applied Mathematics. Varna: Science and Economics, (Chapter Two, 60-104 p.).* The textbook is intended for full-time and distance students in the Bachelor degree in all specialties in the field of higher education "Social, Economic and Legal Sciences" at the University of Economics - Varna,

		who study the discipline "Applied Mathematics", and the content corresponds to the approved curriculum in the discipline. The textbook can also be used by students in the Master's degree who study the discipline "Quantitative Methods". The topics presented in the textbook are related not only to fundamental mathematical knowledge, but also to their application in economics. In a large part of the theoretical statements, examples and tasks, a place has been found for their application with an economic orientation. The textbook can also be of great use to students from other universities studying in specialties in the field of economics, as well as for lecturers using quantitative methods in teaching various economic disciplines. The textbook contains six chapters reflecting the fundamental knowledge of mathematics, which needs to be studied by students in economics, administration and management and tourism, in order to prepare them in a number of economic disciplines and subsequently their full realization. In the first chapter, elements of linear algebra such as matrices, determinants, systems, linear equations and a number of others are considered, and where possible, the close connection of this branch of mathematics with a number of economic analyses is shown. In the second chapter, concepts of analytic geometry in the plane (in two-dimensional space) are considered. Mainly issues related to lines in the plane, coordinates of points, lengths of segments, as well as all basic curves of the second degree are covered. Here again the connection between abstract concepts and their practical applicability in economics is clarified. The third chapter covers issues related to the analysis of a function of a variable and their economic applicability. The differential calculus of a function of a variable is considered in more depth, and basic elements of integral calculus are also presented. In Chapter Four, functions of two or more variables are considered. On the one hand, the fundamental statements on this topic are presented, and on the other hand, the close connection with a number of practical problems related to the dependence of an economic factor on a number of other ones is visible. Chapter Five discusses the mathematical foundations of the theory of probability and random variables. In the field of economics, processes are primarily random in nature, and this chapter serves as the basis for their effective quantitative analysis. Chapter Six is primarily aimed at the application of mathematics in the financial sphere. The specific features of concepts such as "interest", "discount", "annuity", etc. are considered from a quantitative point of view.
79.	4.	*Milkova, T., D. Mihaylov (2016). Operations Research. Varna: Science and Economics. Preface, Chapter One (pp. 9-45), Chapter Third, Fourth, Fifth, and Sixth (pp. 124-336).* The textbook is intended for students from different specialties in the Bachelor and Master degree at the University of Economics – Varna, whose curricula include, as compulsory or elective, the discipline

		"Operations Research". The content of the textbook is fully consistent with the curriculum of this discipline, but can also be used by students of all economic specialties, as well as by PhD students interested in the application of operational tasks in economic research. Operations research emerged as an independent scientific field in the late 1940s, after the first scientific publications appeared, presenting opportunities for applying the methods of operations, tasks primarily for solving military problems, in particular for the analysis and research of military operations. Subsequently, the principles and methods of operations research began to be actively and successfully applied in the organization and management of economic systems. This expands the applied aspects of operational research and the range of tasks to be solved. The main task of each operational study is, based on a quantitative justification, to indicate the one of the many possible options for action, which is defined as the most effective depending on one or another consideration. This option is called optimal, and the considerations on the basis of which this is done are specified in the form of a criterion for optimality. The presented classes of operational tasks in this textbook are primarily oriented towards those directly related to the optimal management and organization of activities in economic systems, taking into account the educational needs of students in economics. According to their content, the set of tasks of the study of operations can be divided into different classes, and the main ones presented in the scientific manual are reduced to the following: problems of game theory; tasks of mass service; inventory management tasks; resource allocation tasks; tasks for repair and replacement of equipment; network planning and management tasks. The approach chosen by the authors in the development of the textbook is expressed in exposition, at the beginning of each paragraph, of the main definitions and statements that are used directly in solving the respective classes of operational tasks. They are followed by methodically developed solutions to task types from the respective class of operational tasks, and then tasks for independent work are proposed. We believe that the scientific manual entitled "Operations Research" can also be useful for the leading exercises in the discipline "Operations Research", taught to students from the University of Economics - Varna, as well as to students in other universities in Bulgaria.