



MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Budgetary Educational Institution of Higher Education
«KAZAN STATE POWER ENGINEERING UNIVERSITY»
(Federal State Budgetary Educational Institution of Higher Education «KSPEU»)

APPROVED

Director of the Institute of
Digital Technologies and
Economics

_____ Zainullin R.R.

«24» February 2026

WORKING PROGRAM OF THE DISCIPLINE

B1.M.16 Basics of statistics

Field of training

38.03.02 Management

Qualification

Bachelor's Degree

Kazan, 2026

The program was developed by:

Name departments	Position, academic degree, academic rank	Full name developer
Department of Digital Systems and Models	Associate Professor, Ph.D., Senior Researcher	Filimonova T.K.

Coordination	Name divisions	Date	No. protocol	Signature
Approved	Department of Digital Systems and Models	26.02.26	2	_____ Head of the Department, Candidate of Physical and Mathematical Sciences, Assoc. Prof. Yu. N. Smirnov
Agreed	Department of Management	10.02.2026	Protocol №5	_____ Head of department, d . social Sc., Prof. Makhyanova A.V.
Agreed	Educational and Methodological Council of the Institute	24.02.2026	Protocol №6	_____ Director, Ph.D., Associate Professor Zainullin R.R.
Approved	Academic Council of the Institute	24.02.2026	Protocol №6	_____ Director, Ph.D., Associate Professor Zainullin R.R.

1. The purpose, objectives and planned learning outcomes of the discipline

The purpose of mastering the discipline “Fundamentals of Statistics” is to acquire knowledge and develop practical skills for the application of statistical methods in professional activities.

The objectives of the discipline are:

- gaining knowledge about the methods of collecting, processing and analyzing statistical data;
- acquiring skills to summarize and group statistical data;
- acquiring skills to analyze the relationships and dynamics of socio-economic phenomena and processes;
- proficiency in modern methods of modeling and forecasting the development of socio-economic processes.

Competencies and indicators developed in students:

Code and name of competence	Code and name of the indicator
GPC-2 Is able to collect, process, and analyze data necessary for solving management tasks using modern tools and intelligent information and analytical systems	GPC-2.2 Demonstrates skills in applying methods of correlation analysis and forecasting
	GPC-2.6 Able to collect, process, and analyze the initial information necessary to solve management and economic tasks using modern tools

2. The place of the discipline in the structure of the educational program

Previous disciplines: Mathematics, Economics

Subsequent disciplines: Economic and mathematical modeling, State Final Attestation, practical training.

3. Structure and content of the discipline

3.1. Structure of the discipline

For full-time study

Type of academic work	Total ZE	Total hours	Semester
			2
GENERAL WORK INTENSITY OF THE DISCIPLINE	3	108	108
CONTACT WORK*	-	65	65
AUDITING WORK	1.5	54	54
Lectures	0.5	18	18
Practical (seminar) classes	1	36	36
Laboratory work	-	-	-
INDEPENDENT WORK OF THE STUDENT	1.5	54	54
Processing of educational material	0.5	18	18
Preparation for midterm assessment	1	36	36
Interim assessment:			E

For part-time and full-time forms of study

Type of academic work	Total ZE	Total hours	Semester
			2
GENERAL WORK INTENSITY OF THE DISCIPLINE	3	108	108
CONTACT WORK	-	55	55
AUDITING WORK	1.11	40	40
Lectures	0.56	20	20
Practical (seminar) classes	0.56	20	20
INDEPENDENT WORK OF THE STUDENT	1.89	68	68
Processing of educational material	1.63	59	59
Preparation for midterm assessment	0.25	9	9
Interim assessment:			E -

3.2. The content of the discipline, structured by sections and types of classes

Sections disciplines	Total hours	Distribution of labor intensity by type of educational work				Forms and appearance control	Indices of indicators of developing competencies
		lectures	lab. worker	etc. zan.	myself. slave.		
Section 1 Statistical observation Statistical methods of classification and grouping	36	6		12	18	TK1	OPK-2, OPK- 2.6, Z , U, V
Section 2 Statistical methods for analyzing the relationships between socio-economic phenomena Sample observation	36	6		12	18	TK2	OPK-2, OPK-2.6, U, V OPK-2-2, Z,U , V
Section 3 Dynamic series Economic indices	36	6		12	18	TK3	OPK-2, OPK-2.6, U, V
Exam					36	OM 3	OPK-2, OPK- 2.6, Z ,U,V OPK-2.2, Z, U, V
Total for 2nd semester	108	18		36	90		
TOTAL	108	18		36	90		

3.3. Content of the discipline

Section 1. Statistical observation . Statistical methods of classification and grouping .

Topic 1.1. History of statistics. Objectives of statistical observation. Statistical observation program. Organizational forms of statistical observation.

Topic 1.2. Summary and grouping of statistical observations. Summary objectives and its main content. Grouping features and their selection.

Topic 1.3. Absolute and relative values. Types of average values and their significance in socio-economic research .

Section 2. Statistical methods for analyzing the relationships of socio-economic phenomena . Sample observation.

Topic 2.1. Statistical distributions and their main characteristics. Variation indices and methods for their calculation.

Topic 2.2. Correlation and regression analysis. Methods for measuring the strength of relationships .

Topic 2.3. Sample observation .

Section 3. Time series . Economic indices

Topic 3.1. Time series and their types. Time series indicators and methods of their calculation.

Topic 3.2. Methods for identifying key development trends. Statistical methods for modeling and forecasting the development of socioeconomic processes, identifying trends and cycles.

Topic 3.3. General concepts of indices and the importance of the index method of analysis. Indices of quantitative and qualitative indicators .

3.4. Thematic plan of practical classes

Practice 1. Collecting statistical information. Using statistical functions in the MS spreadsheet processor Excel (2 hours).

Practice 2. Statistical summary and grouping (4 hours).

Practice 3. Statistical tables. Statistical graphs (2 hours).

Practice 4. Calculation and analysis of absolute and relative indicators. Calculation and analysis of average values (4 hours).

Practice 5. Calculation of absolute and relative indicators of variation of features in the MS spreadsheet Excel (2 hours).

Practice 6. Statistical testing of the nature of distribution using goodness-of-fit tests (2 hours).

Practice 7. One-factor correlation and regression analysis (4 hours)

Practice 8. Multivariate correlation and regression analysis. (4 hours).

Practice 9. Time series and their types. Time series indicators and methods of their calculation (2 hours) .

Practice 10. Statistical methods of modeling and forecasting the development of economic processes (4 hours).

Practice 11. Statistical study of the structure of economic phenomena: indicators of structure and structural shifts (2 hours).

Practice 12. Use of indices in economic and statistical research (4 hours)

3.5. Thematic plan of laboratory work

"This type of work is not provided for in the curriculum."

3.6. Course project/coursework

"This type of work is not provided for in the curriculum."

4. Assessment of learning outcomes

The assessment of learning outcomes in a discipline is carried out within the framework of ongoing monitoring and midterm assessment, conducted using a point-rating system (PRS).

Learning outcomes assessment scale for the discipline:

Code competencies	Code competence indicator	Plan- proved results training in discipline	Level of development competence indicator			
			High	Average	Below average	Short
			from 85 to 100	from 70 to 84	from 55 to 69	from 0 to 54
			Rating scale			
			Great	Fine	satisfactorily	unsatisfactory
			passed			not credited
GPC-2 Is able to collect, proces s, and analyz e data necess ary for solvin g manag ement tasks using moder n tools and intellig ent infor mation and analyti cal system s	GPC-2.2 Demon strates skills in applying methods of correlati on analysis and forecasti ng	know:				
		method for conducting correlation analysis and forecasting	Knows the methods of conducting correlation analysis and forecasting the development of economic phenomena and processes, does not make mistakes	Knows methods of conducting correlation analysis and forecasting the developmen t of economic phenomena and processes , can make several minor mistakes	Poor knowledge of methods for conducting correlation analysis and forecasting the developmen t of economic phenomena and processes , makes many minor mistakes	Does not know the method of conducting correlation analysis and forecasting the developme nt of economic phenomena and processes; the level of knowledge is below the minimum requiremen ts.
		be able to:				
	conduct correlation analysis and forecast the development of economic phenomena and processes	Demonstrates the ability to conduct correlation analysis and forecast the development of economic phenomena and processes, does not make mistakes	Demonstrate s the ability to conduct correlation analysis and forecast the development of economic phenomena and processes, while making a	Overall demonstrate s the ability to conduct correlation analysis and forecasting the development of economic phenomena and processes	to conduct correlation analysis has not been developed to forecast the development of economic phenomena and processes ,	

				number of minor errors	allows for many small errors	makes gross errors
		own:				
	methods for conducting correlation analysis and forecasting economic phenomena and processes	Demonstrates skills in applying methods of correlation analysis and forecasting	Has mastered the methods of conducting correlation analysis and forecasting economic phenomena and processes , but has made a number of mistakes	Demonstrates skills in using methods for conducting correlation analysis and forecasting economic phenomena and processes; many errors; minor errors	Does not possess methods for conducting correlation analysis and forecasting economic phenomena and processes , makes gross errors	
GPC-2.6 Able to collect, process, and analyze the initial information necessary to solve management and economic tasks using modern tools	know:					
	basic methods of collecting, processing and analyzing statistical information	Knows the basic methods of collecting, processing and analyzing statistical information, does not make mistakes .	Knows the basic methods of collecting, processing and analyzing statistical information, can make several minor errors	Poor knowledge of the basic methods of collecting, processing and analyzing statistical information, makes many minor errors	Does not know the basic methods of collecting and processing statistical information ; the level of knowledge is below the minimum requirements.	
	be able to:					
	to collect, process and analyze statistical information necessary to solve the assigned economic problems	Demonstrates the ability to collect, process and analyze statistical information necessary to solve assigned economic problems , and does not make mistakes	Demonstrates the ability to collect, process and analyze statistical information necessary to solve the economic problems , while allowing a number of small errors	In general, demonstrates the ability to collect and process statistical information necessary to solve assigned economic problems , but makes many minor mistakes.	to collect and process statistical information has not been developed and makes gross errors.	
	own:					

		the main methods of collecting, processing and analyzing statistical information necessary for solving the economic problems	Fluent in the basic methods of collecting, processing and analyzing statistical information necessary to solve economic problems without errors.	In the mastery of the basic methods of collecting, processing and analyzing statistical information necessary for solving the economic problems, a number of mistakes were made.	Demonstrates skills in using methods for collecting, processing and analyzing statistical information necessary to solve assigned economic problems, makes many minor mistakes	Does not possess the methods of collecting, processing and analyzing statistical information necessary for solving the assigned economic problems, makes gross errors
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Assessment materials for conducting ongoing monitoring and midterm assessment are provided in the Appendix to the course work program.

A complete set of assignments and materials required for assessing learning outcomes in the discipline is kept at the department developer a .

5. Educational, methodological and informational support of the discipline

5.1 . Educational and methodological support

5.1.1 . Main literature

1. Statistics: textbook / M. N. Tolmachev, V. N. Salin, M. V. Vakhrameeva [etc.]; under general ed. V. N. Salina, M. N. Tolmacheva, E. P. Shpakovskaya. — Moscow: KnoRus, 2025. — 519 p. — ISBN 978-5-406-13644-7. — URL: <https://book.ru/book/95765>.

2. Pozhidaeva, E. S., Statistics: textbook / E. S. Pozhidaeva. - Moscow: Rusigns, 2024. - 259 p. — ISBN 978-5-466-04576-5. — URL: <https://book.ru/book/951977>.

3. Babich, S. G. Theory of statistics: a tutorial / S. G. Babich, E. S. Darda. - Moscow: RTU MIREA, 2024. - 93 p. - ISBN 978-5-7339-2162-4. - Text: electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/420995>.

4. Ilyshev, A. M., General Theory of Statistics: a textbook / A. M. Ilyshev, O. M. Shubat. - Moscow: Knorus, 2025. - 425 p. - ISBN 978-5-406-14682-8. - URL: <https://book.ru/book/957698> (accessed: 05.02.2026). - Text: electronic.

5. Ponkratova, T. A. Statistics: a textbook / T. A. Ponkratova, T. A. Tyuleneva. - Kemerovo: KuzGTU named after T.F. Gorbachev, 2022. - 118 p. - ISBN 978-5-00137-343-8. - Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/295745>

5.1.2. Further reading

1. Economic Statistics. Practical Training: a textbook / V. N. Salin, E. P. Shpakovskaya, T. I. Chinaeva [et al.]; edited by V. N. Salin, E. P. Shpakovskaya. — Moscow: KnoRus, 2024. — 642 p. — ISBN 978-5-406-12548-9. — URL: <https://book.ru/book/951868>.

2. Voskoboinikov, Yu. E. Econometrics in Excel: Paired and Multiple Regression Models: a textbook for universities / Yu. E. Voskoboinikov. — 3rd ed., reprinted — St. Petersburg: Lan, 2024. — 260 p. — ISBN 978-5-507-51642-1. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/426266> (accessed: 07.02.2025).

3. Voskoboinikov, Yu. E. Econometrics in Excel. Time Series Models: a tutorial / Yu. E. Voskoboinikov. — 2nd ed., reprinted. — St. Petersburg: Lan, 2020. — 152 p. — ISBN 978-5-8114-4863-0. — Text: electronic // Lan: electronic library system. — URL: <https://e.lanbook.com/book/126706> (accessed: 07.02.2025).

4. Shikhova, O. A. Data Analysis in Economics Using MS Excel: A Tutorial / O. A. Shikhova. - Vologda: N.V. Vereshchagin All-Russian State Medical Academy of Agricultural Sciences, 2022. - 101 p. - Electronic text // Lan: Electronic Library System. - URL: <https://e.lanbook.com/book/313985>.

5. Rudenko, B. D. Correlation-Regression Analysis in Excel and Mathcad: Laboratory Workshop: A Tutorial / B. D. Rudenko. - Krasnoyarsk: M.F. Reshetnev Siberian State University, 2020. - 82 p. - Electronic text // Lan: Electronic Library System. - URL: <https://e.lanbook.com/book/165902>.

6. Applied statistics: workshop / compiled by T. K. Filimonova. - Kazan: KGEU, 2024. - 194 p. - URL: <https://lib.kgeu.ru/>. - B. c. - Text: electronic.

7. Shmoilova, R.A. Practical Training in the Theory of Statistics: A Textbook for Universities / R.A. Shmoilova, V.G. Minashkin, N.A. Sadovnikova; edited by R.A. Shmoilova. — 3rd ed. - Moscow: Finance and Statistics, 2007. — 416 p.

8. Efimova, M.R. Practical Training in the General Theory of Statistics: A Textbook for Universities / M.R. Efimova, O.I. Ganchenko, E.V. Petrova. — 3rd ed., revised and enlarged. - Moscow: Finance and Statistics, 2008. — 368 p.

5.2. Information support

5.2.1. Electronic and Internet resources

No. p/p	Name of electronic and Internet resources	Link
1	<i>Official website of the Federal State Statistics Service</i>	https://rosstat.gov.ru/
3	<i>International Monetary Fund</i>	https://www.imf.org/external/russian/index.htm
3	<i>Eurostat</i>	https://ec.europa.eu/info/departments/eurostat-european-statistics_en
4	• <i>Encyclopedias, dictionaries, reference books</i>	http://www.rubricon.com
5	• <i>Open Education Portal</i>	http://npoed.ru
6	• <i>Official website of the Territorial Body of the Federal State Statistics Service for the Republic of Tatarstan</i>	https://16.rosstat.gov.ru
7	• <i>US Federal Statistical System</i>	https://ru.qaz.wiki/wiki/Federal_Statistical_System_of_the_United_States
8	<i>Fundamentals of Statistics</i>	https://lms.kgeu.ru/course/view.php?id=407

5.2.2. Professional databases / Information and reference systems

No. p/p	Name of professional databases	Address	Mode access
1	<i>Official website of the Government of the Russian Federation</i>	http://government.ru/	http://www.mathnet.ru
2	<i>All-Russian Mathematical Portal</i>	http://www.mathnet.ru	http://www.mathnet.ru
3	<i>Official website of the Ministry of Energy of the Russian Federation</i>	https://minenergo.gov.ru/opendata	https://minenergo.gov.ru/opendata
4	<i>Ministry of Economic Development of the Russian Federation</i>	https://economy.gov.ru/	https://economy.gov.ru/
5	<i>Official website of the Ministry of Finance of the Russian Federation</i>	http://www.minfin.ru	http://www.minfin.ru
6	<i>Scientific Electronic Library</i>	http://elibrary.ru	http://elibrary.ru
7	<i>Russian State Library</i>	http://www.rsl.ru	http://www.rsl.ru
8	<i>International abstract database</i>	http://www.zbmath.org	http://www.zbmath.org

	<i>of scientific publications zbMATH</i>		
9	<i>Springerlink, an international database of scientific publications.</i>	http://link.springer.com	http://link.springer.com
10	<i>Educational portal</i>	http://www.uceba.com	http://www.uceba.com

5.2.3. Licensed and freely distributed software for the discipline

No. p/p	Name of the software	Description	Details of supporting documents
1	Office Professional Plus 2007 Windows32 Russian DiskKit MVL CD	A software package containing the necessary office programs	SoftLineTrade CJSC No. 225/10 dated January 28, 2010. Non-exclusive right. Indefinite.
2	Chrome Browser	Internet information search system	Free License. Unexclusive right. Perpetual.
3	LMS Moodle	Software for effective online interaction between teachers and students	Free License. Unexclusive right. Perpetual.
54	Windows 7 Professional (SevenPro_Check)	Custom operating system	"ZAO "TaksNet-Service"" No. PO-LIC 0000/2014 dated 05/27/2014 Non-excludable right. Indefinitely

6. Logistical support of discipline

Name of the type of academic work	Name of the classroom, specialized laboratory	List of necessary equipment and technical training aids
Lectures	A classroom for conducting lecture-type classes	Specialized educational furniture, technical teaching aids used to present educational information to a large audience (multimedia projector, computer (laptop), screen), demonstration equipment, educational visual aids
Practical classes	A classroom for conducting seminar-type classes, group and individual consultations, ongoing monitoring and midterm assessments	Specialized educational furniture, technical teaching aids (multimedia projector, computer (laptop), screen), etc.
Independent work	Computer class with Internet	Specialized educational furniture for 30 seats,

	access B-600a	30 computers, technical teaching aids (multimedia projector, computer (laptop), screen), video cameras, software
	Reading room libraries	Specialized furniture, computer equipment with Internet access and access to the electronic information system (EIOS), a screen, a multimedia projector, and software

7. Features of the organization of educational activities for persons with disabilities and disabled people

Persons with disabilities (PWD) and individuals with disabilities have the opportunity to move freely from one educational and laboratory building to another, ascend to all floors of educational and laboratory buildings, and study in educational and other rooms, taking into account the characteristics of their psychophysical development and health status.

Barrier-free access to all classrooms is provided for students with disabilities and those with musculoskeletal disorders. Information on the special conditions created for students with disabilities and those with disabilities is available on the university website [www // kgeu.ru](http://www.kgeu.ru). Technical assistance is available from an assistant, as well as sign language and audio-visual interpreters .

To adapt reference and educational material on the subject to the perception of persons with disabilities and persons with impaired hearing, the following conditions are provided:

- For better orientation in the classroom, signals are used to announce the beginning and end of the lesson (the word “bell” is written on the board);
- The attention of the hearing-impaired student is attracted by the teacher with a gesture (a hand is placed on the shoulder and a gentle pat is made);
- When talking to a student, the teaching staff looks at him, speaks clearly, in short sentences, allowing for lip reading.
- For better orientation in the classroom, signals are used to announce the beginning and end of the lesson (the word “bell” is written on the board);
- the attention of the hearing-impaired student is attracted by the teacher with a gesture (a hand is placed on the shoulder and a gentle pat is made);
- When talking to a student, the teaching staff looks at him, speaks clearly, in short sentences, allowing for lip reading.

Compensation for speech and intellectual development difficulties in hearing-impaired students is carried out by:

- use of diagrams, charts, drawings, computer presentations with hyperlinks commenting on individual components of the image;
- regular use of exercises for graphically highlighting the essential features of objects and phenomena;
- providing the opportunity for the student to receive targeted advice by e-mail as needed.

In order to adapt the reference, educational, and awareness-raising material provided by the educational program for the chosen field of study to the perception

of individuals with disabilities and visually impaired persons, the following conditions are provided:

- The official website is being adapted to take into account the special needs of visually impaired people, and large-font reference information on the schedule of classes is being provided;
- the teaching staff member and his interlocutor (if necessary), who are present at the lesson, introduce themselves to the student, and each time the person to whom the teaching staff member is addressing is named;
- the actions, gestures, and movements of the teaching staff are briefly and clearly commented on;
- printed information is provided in large font (from 18 points) and is fully voiced;
- the required level of illumination of the premises is ensured;
- the opportunity to use computers during classes and the right to record explanations on a voice recorder (at the students' discretion) is provided.

The format for ongoing and midterm assessments for students with disabilities is determined by the teaching staff in accordance with the curriculum. If necessary, students with disabilities and those with disabilities, taking into account their individual psychophysical characteristics, are given the opportunity to complete midterm assessments orally, in writing, on a computer, through testing, etc., or are given additional time to prepare their responses.

8. Methodological recommendations for teachers on organizing educational work with students.

Methodological support for the student development process is one of the defining factors of high-quality education. By demonstrating high professionalism, erudition, a clear civic position, self-discipline, and a creative approach to solving professional problems, university teachers contribute to the development of a well-rounded individual throughout the educational process.

When implementing the discipline, the teacher can use the following educational methods:

- methods of forming the individual's consciousness (conversation, debate, suggestion, instruction, control, explanation, example, self-control, story, advice, persuasion, etc.);
- methods of organizing activities and forming behavioral experience (task, public opinion, pedagogical requirement, assignment, training, creation of educational situations, training, exercise, etc.);
- methods of motivating activity and behavior (approval, encouragement of social activity, censure, creation of situations of success, creation of situations for emotional and moral experiences, competition, etc.)

When implementing the discipline, the teacher must take into account the following areas of educational activity:

Civic and patriotic education:

- the development of a holistic worldview in students, Russian identity, respect for their family, society, state, spiritual, moral and socio-cultural values accepted in the

family and society, for the national, cultural and historical heritage, and the development of a desire to preserve and develop it;

- to develop in students an active civic position based on the traditional cultural, spiritual and moral values of Russian society, in order to increase their ability to responsibly exercise their constitutional rights and obligations;

- development of the legal and political culture of students, expansion of constructive participation in decision-making affecting their rights and interests, including in various forms of self-organization, self-government, and socially significant activities;

- the formation of motives, moral and semantic attitudes of the individual that enable them to resist extremism, xenophobia, discrimination on social, religious, racial, national grounds, interethnic and interfaith intolerance, and other negative social phenomena.

Spiritual and moral education:

- fostering a sense of dignity, honor and honesty, conscientiousness, respect for parents, teachers, and older people;

- the formation of principles of collectivism and solidarity, a spirit of mercy and compassion, and the habit of caring for people in difficult life situations;

- developing solidarity and a sense of social responsibility towards people with disabilities, overcoming psychological barriers towards people with disabilities;

- the formation of an emotionally rich and spiritually elevated attitude towards the world, the ability and skill to convey one's aesthetic experience to others.

Cultural and educational education:

- formation of an aesthetic picture of the world;

- developing respect for the cultural values of one's hometown, region, country;

- increasing the cognitive activity of students.

Scientific and educational education:

- formation of a scientific worldview in students;

- development of the ability to acquire knowledge;

- development of skills for analysis and synthesis of information, including in the professional field.

Changes and approvals for the new academic year

No. p/p	Section No. of the contribution	Date of entry changes	Contents of the changes	" Agreed" by the Head of the Department implementing the	" Agreed" Chairman of the Institute's (Faculty's) Teaching and Methodological Committee (TMC),
1	2	3	4	5	6
1					
2					
3					



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ASSESSMENT MATERIALS
for the discipline

B1.M.16 Basics of statistics

(Name of the discipline in accordance with the curriculum)

2 . Assessment materials for ongoing monitoring and midterm assessment

Learning outcomes assessment scale for the discipline:

Code competencies	Code competence indicator	Plan- roved results training in discipline	Level of development competence indicator			
			High	Average	Below average	Short
			from 85 to 100	from 70 to 84	from 55 to 69	from 0 to 54
			Rating scale			
			Great	Fine	satisfactorily	unsatisfactor y
			passed			not credited
GPC-2 Is able to collect, process , and analyze data necessa ry for solving manage ment tasks using modern tools and intellig ent informa tion and analytic al systems	GPC-2.2 Demonstr ates skills in applying methods of correlatio n analysis and forecastin g	know:				
		method for conducting correlation analysis and forecasting	Knows the methods of conducting correlation analysis and forecasting the development of economic phenomena and processes, does not make mistakes	Knows methods of conducting correlation analysis and forecasting the developmen t of economic phenomena and processes , can make several minor mistakes	Poor knowledge of methods for conducting correlation analysis and forecasting the developmen t of economic phenomena and processes , makes many minor mistakes	Does not know the method of conducting correlation analysis and forecasting the developm ent of economic phenomen a and processes; the level of knowledg e is below the minimum requireme nts.
		be able to:				
	conduct correlation analysis and forecast the development of economic phenomena and processes	Demonstrates the ability to conduct correlation analysis and forecast the development of economic phenomena and processes, does not make mistakes	Demonstrate s the ability to conduct correlation analysis and forecast the development of economic phenomena and processes, while making a number of minor errors	Overall demonstrate s the ability to conduct correlation analysis and forecasting the development of economic phenomena and processes allows for many small errors	to conduct correlation analysis has not been developed to forecast the developme nt of economic phenomen a and processes , makes gross errors	

		own:				
		methods for conducting correlation analysis and forecasting economic phenomena and processes	Demonstrates skills in applying methods of correlation analysis and forecasting	Has mastered the methods of conducting correlation analysis and forecasting economic phenomena and processes , but has made a number of mistakes	Demonstrates skills in using methods for conducting correlation analysis and forecasting economic phenomena and processes; many errors; minor errors	Does not possess methods for conducting correlation analysis and forecasting economic phenomena and processes , makes gross errors
	GPC-2.6 Able to collect, process, and analyze the initial information necessary to solve management and economic tasks using modern tools	know:				
		basic methods of collecting, processing and analyzing statistical information	Knows the basic methods of collecting, processing and analyzing statistical information, does not make mistakes .	Knows the basic methods of collecting, processing and analyzing statistical information, can make several minor errors	Poor knowledge of the basic methods of collecting, processing and analyzing statistical information, makes many minor errors	Does not know the basic methods of collecting and processing statistical information; the level of knowledge is below the minimum requirements.
		be able to:				
to collect, process and analyze statistical information necessary to solve the assigned economic problems	Demonstrates the ability to collect, process and analyze statistical information necessary to solve assigned economic problems , and does not make mistakes	Demonstrates the ability to collect, process and analyze statistical information necessary to solve the economic problems , while allowing a number of small errors	In general, demonstrates the ability to collect and process statistical information necessary to solve assigned economic problems , but makes many minor mistakes.	to collect and process statistical information has not been developed and makes gross errors.		
own:						

		the main methods of collecting, processing and analyzing statistical information necessary for solving the economic problems	Fluent in the basic methods of collecting, processing and analyzing statistical information necessary to solve economic problems, without errors.	In the mastery of the basic methods of collecting, processing and analyzing statistical information necessary for solving the economic problems, a number of mistakes were made.	Demonstrates skills in using methods for collecting, processing and analyzing statistical information necessary to solve assigned economic problems, makes many minor mistakes	Does not possess the methods of collecting, processing and analyzing statistical information necessary for solving the assigned economic problems, makes gross errors
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"**excellent**" grade is awarded for completing *practical work during the semester; test assignments; a deep understanding of statistical methods for calculating economic indicators, completing individual assignments, and providing complete and informative answers to the questions on the exam (theoretical and practical assignments)* ;

A grade of "**good**" is awarded for completing *practical work during the semester; test assignments; understanding of statistical methods for calculating economic indicators, completing individual assignments, and answering questions on the exam ticket (theoretical or practical assignment)*;

The grade "**satisfactory**" is given for the completion of *practical work during the semester and test assignments*;

The grade "**unsatisfactory**" is given for weak and incomplete completion of *practical work during the semester and test assignments*.

3 . List of appraisal funds

Brief description of the assessment tools used for ongoing monitoring of student progress and midterm assessment of the subject:

Name evaluative means	Brief description of the assessment tool	Description of the evaluation means
Taking notes on educational material	A short textual presentation of the processed information	List of sections
Multimedia presentation (MP)	Presentation of educational content using multimedia technologies	Presentation topics
Practical Work	Conducting practical work, processing measurement	List of tasks and

Report (PWR)	and experimental results. Preparing a report and presenting the results of the practical work.	questions for the defense of practical work, list of requirements for the report
Test (Test)	A system of standardized assignments that allows for the automation of the procedure for measuring the level of knowledge and skills of a student	Set of test tasks
Colloquium (K)	A means of monitoring the assimilation of educational material of a topic, section or sections of a discipline, organized as a training session in the form of an interview between a teacher and students	Questions on topics/sections of the discipline

4. A list of test assignments or other materials necessary for assessing knowledge, skills and abilities characterizing the stages of competence development in the process of mastering the discipline

Example of a task

For current control of TK 1:

Tested competency: **OPK-2.** Capable of collecting, processing, and statistically analyzing data necessary to solve assigned economic problems; **OPK-2.6.** Capable of collecting, processing, and analyzing source information necessary to solve assigned management and economic problems, using modern tools .

Test

1. A single element that has certain characteristics is called...
 - a unit of the population
 - unit of observation
 - statistical indicator
 - statistical form

2. An employee for whom the collection of statistical data is a professional activity is called...
 - statistician
 - an extra
 - a copyist
 - data collector

3. A set of units that have mass character, homogeneity, a certain integrity, interdependence of state and the presence of variation are called statistical...
 - a set
 - regularity
 - indicator
 - methodology

4. A variation is called...
 - change in the values of a feature when moving from one observation unit to another
 - the percentage ratio of the average linear deviation to the average value of the feature
 - the arithmetic mean of absolute values, deviations of a variant of a feature from their average
 - the mean square of deviations of individual values of a characteristic from their average value

5. Non-quantitative traits by the nature of variation, which can take only two values, are called ...
- - alternative
 - continuous
 - discrete
 - secondary
6. Registration errors may be...
- + random, systematic
 - - logical, arithmetic
 - - selective, continuous
 - - seasonal, periodic
7. *Supplement*

Statistical reporting is... statistical observation

8. *Supplement*

Self-registration is ... statistical observation.

9. *Supplement*

There is a distribution series:

Wage category of workers: 2 3 4 5 6

Number of workers: 8 16 17 12 7

The average wage grade of workers is ... (with an accuracy of 0.1)

10. *Supplement*

... a statistical table is an object characterized by numbers.

Taking notes on educational material

Section 1. Statistical observation . Statistical methods of classification and grouping .

Topic 1.1. History of statistics. Objectives of statistical observation. Statistical observation program. Organizational forms of statistical observation.

Topic 1.2. Summary and grouping of statistical observations. Summary objectives and its main content. Grouping features and their selection.

Topic 1.3. Absolute and relative values. Types of average values and their significance in socio-economic research.

Practical Work Report (PWR)

Practice 1. Collecting statistical information. Using statistical functions in the MSEXCEL spreadsheet (2 hours)

The purpose of the work

1. To study the basic provisions and definitions, classification, type and kind of indicators used in statistical measurements.

EXCEL spreadsheets to conduct statistical analysis of data on a personal computer.

Individual assignment for completing work

1. Conduct a statistical study (for example, a survey of commercial banks,

construction companies, insurance companies, enterprises in a specific industry, healthcare institutions, cultural institutions, higher education institutions, retail chains, etc.

To do this, determine:

- 1) object and unit of observation;
- 2) characteristics subject to registration;
- 3) type and method of observation;
- 4) develop a form and write brief instructions for filling it out;
- 5) draw up an organizational plan for the survey;
- 6) make an observation and present the results in the form of statistical tables and graphs.

The practical work report must contain :

- topic of practical work,
- the purpose of practical work,
- brief theoretical information,
- individual assignment option,
- analysis of the obtained results,
- conclusions.

Security questions

1. Define statistical observation. What is its essence?
2. What questions are included in the observation plan?
3. What is the purpose of observation?
4. What is an “object of observation” and how is it defined?
5. What is an observation unit?
6. What is a monitoring program and how is it designed?
7. In what forms is surveillance carried out?
8. What types of observation are divided according to the time of registration and the degree of coverage of observation units?
9. What rules must the questions of the statistical observation program satisfy?
MS spreadsheet? EXCEL ?

For extra points in Section 1. (15 points).

Multimedia presentation (MP) (5 points). -

Presentation topics:

1. Statistical science, its subject and method.
2. Organizational forms of statistical observation.
3. History of the development of statistics in Russia.
4. The history of the development of statistics in Germany
5. History of the development of statistics in England and other countries.
6. Modern organization of state statistics in Russia, its tasks and functions.
7. Sources of statistical information (Internet resources) in Russia and other countries.
8. Outstanding statisticians in Russia.
9. Outstanding statisticians in Germany.

10. Outstanding statisticians in England.
11. Types of average values and their meanings in economic research.
12. Statistical tables (using data from statistical yearbooks and Internet resources).
13. Statistical graphs (using data from statistical yearbooks and Internet resources).

Colloquium (K) (10 points). -

Questions on topics/sections of the discipline

1. Tasks of economic statistics.
2. Statistical observation. The purpose of statistical observation.
3. Object of statistical observation. Unit of statistical observation. Statistical observation program.
4. What rules must the questions of the statistical observation program satisfy?
5. What specially organized statistical observations do you know?
6. How can non-continuous observations be carried out?
7. Methods of recording statistical observations.
8. Types of survey?
9. What is grouping and what does it mean in statistics?
10. What is called a group characteristic (the basis for grouping)?
11. By what criteria can distribution series be formed? Examples.
12. What is a statistical table?
13. How do statistical tables differ by subject?
14. What errors can occur during statistical observation?
15. What methods of monitoring surveillance materials do you know?
16. What are the basic requirements for the construction and design of a statistical table?
17. What quantities are called absolute in statistics? What are the units of measurement for absolute quantities?
18. What are relative quantities? Name the types of relative quantities.
19. What is the purpose of statistical graphs?
20. What is a distribution polygon or histogram? What are they used for, and what are the basic rules for constructing them?
21. What types of average values do you know?

For current control of TK2:

Competence tested:

OPK-2 is capable of collecting, processing and statistically analyzing data necessary to solve assigned economic problems;

OPK-2.2 Demonstrates skills in applying methods of correlation analysis and forecasting

OPK-2.6 is capable of collecting, processing and analyzing initial information necessary for solving assigned management and economic tasks, using modern tools .

Test

1. For the analytical expression of a nonlinear relationship between factors, the following formulas are used:

- $\bar{y}_x = a_0 + \frac{a_1}{x}$
- $\bar{y}_x = a_0 + a_1 x + a_2 x^2$
- $\bar{y}_x = a_0 + a_1 x$

2. The closest relationship is shown by the correlation coefficient $r_{xy} = \dots$

- $r_{xy} = 0,871$
- $r_{xy} = 0,982$
- $r_{xy} = 0,991$

3. The coefficient of determination can take the following values:

- from 0 to 1
- from -1 to 0
- any positive
- from -1 to 1
- any less than zero

4. Traits that change under the influence of factor traits are called ...

5. A relationship in which a specific value of a factor characteristic corresponds to only one value of a result characteristic is ...

6. ... regression reflects the relationship between the outcome and factor characteristics.

7. Types of non-continuous statistical observation:

- specially organized surveillance
- monographic
- current statistical observation
- sample observation
- survey of the main array

8. The sample size that would allow us to estimate the proportion of defective products in a batch of 10,000 bakery products with an accuracy of 2% at a 5% significance level is:

- 2500
- 826
- 2000

9. If 20 of the 400 marriages examined in a sample turned out to be “catch-up” marriages, then with 5% significance the share of such marriages in the region does not exceed ...%.

- 3
- 7
- 5

10. If the probability guaranteeing the result is increased from 0.954 to 0.997, then the volume of the repeated random sample will increase by ... times.

Taking notes on educational material

Section 2. Statistical methods for analyzing the relationships of socio-economic phenomena . Sample observation.

Topic 2.1. Statistical distributions and their main characteristics. Variation indices and methods for their calculation.

Topic 2.2. Correlation and regression analysis. Methods for measuring the strength of relationships .

Topic 2.3. Sample observation .

Practical Work Report (PWR)

Practice 5. Calculation of absolute and relative indicators of variation of a trait (4 hours)

The purpose of the work

1. To study the methodology for calculating absolute and relative indicators of variation of a feature.
2. To develop practical skills in calculating absolute and relative indicators of variation of a characteristic based on statistical data.
3. Calculate absolute and relative indicators of variation of a trait.

Individual assignment for completing work

1. Familiarize yourself with the methodology for calculating absolute and relative indicators of variation of a trait.
2. Obtain a version of the individual assignment from the teacher.
3. Calculate the absolute and relative indicators of variation of the feature in the MS Excel spreadsheet .
4. Draw conclusions on the work and prepare a report.

Report preparation

practical work report must contain:

- topic of practical work,
- the purpose of practical work,
- brief theoretical information,
- individual assignment option,
- necessary illustrative material,
- calculation results,
- analysis of the obtained results,
- conclusions.

Security questions

1. What is a trait variation, and what does its size depend on?
2. What is the range of variation of a trait?

3. What is the variance of a feature?
4. What measures of relative dispersion are used in statistics?
5. How is the coefficient of variation calculated and its significance for economic analysis?

Practice 7. One-factor correlation and regression analysis

Objective of the work: to study the methodology and acquire practical skills in conducting single-factor correlation and regression analysis.

Individual assignment

1. Learn about the methodology for conducting single-factor correlation and regression analysis.
2. Using the data (the variant number corresponds to the serial number in the group journal), plot the source data using MSEXCEL and try to visually and approximately determine the nature of the dependence.
3. Calculate the regression coefficients and determine the direction of the relationship between the outcome feature and the factor feature.
4. Assess the strength of the relationship using the pairwise correlation coefficient and the coefficient of determination.
5. Assess the significance of the calculated regression coefficients using Student's t-test.
6. Check the adequacy of the constructed model using Fisher's F -test.
7. Perform a regression analysis of the data in MS Excel using the Data **Analysis** command in the **Data** menu and the **Regression analysis tool** .
8. Prepare a work report.

Report preparation

practical work report must contain:

- topic of practical work,
- the purpose of practical work,
- brief theoretical information,
- individual assignment option,
- necessary illustrative material,
- calculation results,
- analysis of the obtained results,
- conclusions.

Control questions

1. What are the main tasks solved using correlation and regression analysis?
2. Formulate Legendre's principle.
3. What indicators measure the strength of the correlation relationship?
4. What is the difference between a stochastic relationship and a functional relationship?
5. What is the significance of the regression equation? What do the regression coefficients characterize?
6. What is the purpose of the correlation coefficient? What is its range of variation?
7. How is the significance of regression coefficients tested?
8. How to check the adequacy of the equation as a whole?
9. In what cases is the multiple regression model used?
10. How is correlation and regression analysis performed in MS Excel?

For extra points in Section 2. (15 points)

Colloquium (K) (15 points). -

Questions on topics/sections of the discipline

1. Variation indices. Absolute and relative variation indices.
2. What is trait variation ? What determines its size?
3. What is the range of variation of a trait?
4. What is feature variance?
5. What measures of relative dispersion are used in statistics?
6. How is the coefficient of variation calculated and what is its significance for economic analysis?
7. Forms, types of statistical relationships.
8. What are the main tasks solved using correlation and regression analysis?
9. Formulate Legendre's principle.
10. What indicators measure the strength of the correlation relationship?
11. What is the difference between a stochastic relationship and a functional relationship?
12. What is the significance of a regression equation? What do the regression coefficients characterize?
13. What is the purpose of the correlation coefficient? What is its range of variation?
14. How is the significance of regression coefficients tested?
15. How to check the adequacy of the equation as a whole?
16. When is the multiple regression model used?
17. What is the economic meaning of elasticity coefficients?
18. What are the basic rules for constructing a multifactorial correlation model?
19. What is the nature and purpose of pairwise and partial correlation coefficients?
20. Specify the basic essence and meaning of the aggregate multiple correlation coefficient and the aggregate coefficient of determination.
21. How to economically interpret a multivariate regression model ?
22. What is the economic meaning of elasticity coefficients, β - and Δ -coefficients ?
23. What criterion is used to test the significance of a regression equation?
24. How is the statistical significance of the parameters of a regression equation assessed?
25. A measure of the strength of a statistical relationship. Correlation coefficient .
26. index , contingency coefficient, association coefficient .
27. Rank coefficients.
28. What observations are called sample observations ?
29. How is random selection done?
30. How is mechanical selection carried out?
31. How is type selection carried out?
32. How is serial selection carried out?
33. How is marginal sampling error calculated?

For current control of TK3:

Competence tested:

OPK-2 is capable of collecting, processing and statistically analyzing data necessary to solve assigned economic problems;

OPK-2.6 is capable of collecting, processing and analyzing initial information necessary for solving assigned management and economic tasks, using modern tools .

Test

1. The moment series of dynamics is...
 - the amount of bank deposits of the population at the end of each year
 - balance of material assets as of a certain date of each month
 - labor productivity at the enterprise for each month of the year
 - average wages of workers and employees by month of the year

2. The ratio of the absolute increase in the level of a series over a time interval to the rate of increase over the same time interval is used to calculate the indicator...
 - growth rate
 - relative acceleration
 - absolute increase
 - absolute value of 1% increase

3. If the growth rate of production volumes over the two analyzed periods of time was 140%, this means that the volume of production increased...
 - 4 times
 - by 40%
 - by 140%
 - 14 times

4. In 2018 , the company increased its output by 10% compared to 2017 , and in 2019 , the company's output decreased by 5% compared to 2018. Output in 2000 compared to 2018 amounted to ... % (with an accuracy of 0.1%).
5. In 2020 , the capital intensity of production was 108% of its level in 2018. The average annual growth rate of capital intensity is ... % (accurate to 0.1).

6. In the index of physical volume of production, the non-indexed value will be:
 - quantity of products in physical terms
 - weight
 - price
 - cost price

7. The aggregate index of physical volume of production is defined as:
 - $\frac{\sum p_1 q_1}{\sum p_0 q_0}$
 - $\frac{\sum q_1 p_0}{\sum q_0 p_0}$

$$\begin{aligned}
 & \frac{\sum q_1 p_0}{\sum q_0 p_1} \\
 - & \frac{\sum q_0 p_0}{\sum p_1 q_1}
 \end{aligned}$$

8. The system of basic indices of physical volume of production with constant weights has the following form:

$$\begin{aligned}
 - & \frac{\sum q_1 p_0}{\sum q_0 p_0}, \frac{\sum q_2 p_0}{\sum q_1 p_0}, \dots, \frac{\sum q_n p_0}{\sum q_{n-1} p_0} \\
 - & \frac{\sum q_1 p_0}{\sum q_0 p_0}, \frac{\sum q_2 p_0}{\sum q_0 p_0}, \dots, \frac{\sum q_n p_0}{\sum q_0 p_0} \\
 - & \frac{\sum q_1 p_1}{\sum q_0 p_0}, \frac{\sum q_2 p_2}{\sum q_0 p_0}, \dots, \frac{\sum q_n p_n}{\sum q_0 p_0} \\
 - & \frac{\sum q_1 p_1}{\sum q_0 p_1}, \frac{\sum q_2 p_2}{\sum q_0 p_2}, \dots, \frac{\sum q_n p_n}{\sum q_0 p_0}
 \end{aligned}$$

9. It is known that the index of constant composition is 102.5%, and the index of structural shifts is 100.6%. The index of variable composition is ... % (with an accuracy of 0.1%).

10. During the reporting period, 5,400 people worked in Section 1 and 6,200 people in Section 2, with labor productivity increasing by 3% and 5%, respectively. The composite labor productivity index is ... (accurate to 0.1%).

Taking notes on educational material

Section 3. Time series . Economic indices

Topic 3.1. Time series and their types. Time series indicators and methods of their calculation.

Topic 3.2. Methods for identifying key development trends. Statistical methods for modeling and forecasting the development of socioeconomic processes, identifying trends and cycles.

Topic 3.3. General concepts of indices and the importance of the index method of analysis. Indices of quantitative and qualitative indicators.

Practical Work Report (PWR)

Practice 10. Statistical methods for modeling and forecasting the development of economic processes

The purpose of the work

1. Explore methods of interval enlargement, moving average, and analytical alignment to identify trends in time series.
2. To study the method of calculating the parameters of the trend in dynamic series.

3. To develop practical skills in calculating the parameters of the trend equation for a dynamic series.
4. Construct a trend equation for a dynamic series and conduct a statistical analysis of the significance of its parameters.

Individual assignments

Explore the underlying trend in time series using statistical data. To do this:

- 1) Using the analytical alignment method, construct a trend model reflecting the pattern of development of the phenomenon; present the initial and calculated data for determining the trend parameters in tabular form;
- 2) graphically depict the actual and adjusted levels of the dynamic series under study;
- 3) make an interval forecast of the expected value of the series level for the year specified by the teacher, guaranteeing a result with a given probability $\Phi(t) = 95\%$.

Report preparation

practical work report must contain:

- topic of practical work,
- the purpose of practical work,
- brief theoretical information,
- individual assignment option,
- necessary illustrative material,
- calculation results,
- analysis of the obtained results,
- conclusions.

Security questions

1. Define a time series. What elements does it consist of?
2. What dynamic series are called moment series, what is their peculiarity?
3. What dynamic series are called interval series, what is their peculiarity?
4. What are the reasons for the incomparability of dynamic series?
5. Provide a definition of the main development trend in dynamic series.
6. What statistical methods are used to identify trends in time series?
7. What is the essence of the interval enlargement method and what is it used for?
8. How is smoothing of time series performed using the moving average method?
9. What is the essence of the method of analytical alignment of dynamic series?
10. How is the type of trend equation determined?

For extra points in Section 3. (15 points)

Colloquium (K) (15 points). -

Questions on topics/sections of the discipline

1. What types of time series exist?
2. What dynamic series are called moment series and why cannot their levels be summed?

3. What series of statistical quantities are called interval series? Why can their levels be summed? Give examples.
4. What techniques are used to transform incomparable time series into comparable ones?
5. What is the essence of the interval enlargement method and what is it used for?
6. How is time series smoothed using a moving average? What are the advantages and disadvantages of this method?
7. What is the essence of the method of analytical alignment of dynamic series?
8. How to determine the type of the dynamics trend equation?
9. What are seasonal fluctuations and what is the practical significance of studying them?
10. What is called an index in statistics?
11. What do individual indices characterize? Give examples.
12. How are aggregate price indices (Paasche and Leipzig) calculated?
13. What is called a variable composition index, how is it calculated and what does it characterize?
14. What index is called the index of constant composition, how is it calculated and what does it characterize?
15. What does the structural break index characterize and how is it calculated?
16. How is the aggregate index of production costs calculated and what does it characterize?

For interim assessment:

Interim assessment task.

Problem 1

The following data are known for the reporting month for three enterprises producing the same type of product:

Enterprise	Number of workers	Output per worker, pcs.	Unit cost of production, thousand rubles.
1	120	500	3.0
2	150	800	2.5
3	300	850	2.0

Calculate:

- 1) average number of workers per enterprise;
- 2) average output per worker;
- 3) average unit cost. What types of averages were used?

Problem 2

The following data are available on the age structure of production equipment in the Russian Federation industry in 2009 and 2010 :

Equipment age, years	Quantity of equipment, % of total	
	2009	2010

Up to 5	29.4	8.6
6-10	28.3	5.1
11-15	16.5	12.3
16-20	10.8	22.5
More than 20	15.0	51.5
Total	100.0	100.0

Determine in each year and compare:

- 1) average age of equipment;
- 2) mode, median;
- 3) dispersion, standard deviation, coefficient of variation

Construct a histogram and cumulative distribution of equipment by age. Draw conclusions about the changing age structure of equipment.

Problem 3

There is the following grouping of operating credit institutions of the Russian Federation by the size of their registered authorized capital as of April 1, 2009 and 2010:

Authorized capital, million rubles.	Number of enterprises, % of total	
	2009	2010
Up to 3	12.5	4.5
3-10	19.7	8.5
10-30	24.1	16.4
30-60	19.3	16.9
60-150	10.3	18.1
150-300	6.2	16.3
Over 300	7.9	19.4
Total	100.0	100.0

Determine for each year:

- 1) the average size of the authorized capital of credit institutions;
- 2) mode and median;
- 3) coefficient of variation;
- 4) Indicators of capital differentiation and concentration. Draw conclusions about changes in the size and structure of the authorized capital of credit institutions.

Problem 4

There are data on the distribution of households in the Russian Federation by the amount of annual disposable income in 2009:

Annual disposable household income, US\$ thousands, over	Number of households, % (cumulative totals)
0.75	97.20
1.00	95.30
1.75	87.60
2.50	77.90
5.00	44.30
7.50	21.80
10.00	10.40
15.00	2.50
25.00	0.25

35.00	0.05
45.00	0.01

1. Construct an interval variation series.
2. Determine the average annual disposable income per household.
3. Calculate:
 - a) mode and median;
 - b) the first and third quartiles;
 - c) decile coefficient of income differentiation;
 - c) Gini coefficient of income concentration.

Problem 6

The distribution of the population of the Russian Federation by the size of the average monthly per capita income in April 1998 was characterized by the following data:

Average monthly per capita income, thousand rubles.	Population size, million people
Up to 5	6.6
5-10	39.8
10-15	45.6
15-20	33.4
20-25	21.6
Over 25	1.7
Total	148.7

1. Determine the average monthly per capita income in April 1998 .
2. Determine the standard deviation.
3. Based on the hypothesis of normal distribution, calculate the theoretical frequencies in this series.
4. Using the Pearson (χ^2), Romanovsky and Kolmogorov (λ) tests, check whether the empirical distribution is consistent with the hypothetical normal distribution.

Problem 7

The following distribution of 100 randomly surveyed samples from peat areas is available based on the depth of peat occurrence:

Peat depth, cm	Number of samples
70-80	2
80-90	6
90-100	19
100-110	30
110-120	22
120-130	13
130-140	5
140-150	3
total	100

1. Calculate theoretical frequencies based on the hypothesis of normal distribution.
2. Using the Pearson test, check whether the empirical distribution is consistent with the hypothetical normal distribution.

Problem 8

, 50 items were tested for each of 200 workers producing identical products. The results are as follows:

Number of defective items out of 50 tested	Number of workers
0	110
1	59
2	26
3	4
4	1
total	200

1. Calculate the average number of defective products per worker.
2. Calculate theoretical frequencies based on the hypothesis of the Poisson distribution.
3. Check whether the discrepancies between empirical and theoretical frequencies are random or not, using Pearson, Romanovsky, and Kolmogorov criteria.

Problem 9

The following distribution of 200 farms in one of the regions by grain yield is available:

Yield, c/ha	Number of farms
Up to 20	7
20-24	18
24-28	34
28-32	56
32-36	38
36-40	21
40-44	10
Over 44	6
Itoiro	200

1. Calculate theoretical frequencies (number of farms) based on the hypothesis of normal distribution.
2. Using the Pearson, Romanovsky, and Kolmogorov tests, check whether the empirical distribution is consistent with the hypothetical normal distribution.

Problem 10

A sample survey of shoppers at one of the city's major department stores is planned to determine the proportion of shoppers from other cities. What sample size should be used to guarantee an accuracy of the result of 5% with a probability of 0.9545?

Problem 11

The work experience of 120 men and 80 women was randomly assessed at the company. The following are the results:

A group of workers	Number of employees	Average length of service, years \tilde{x}_i	Standard deviation of length of service, years σ_i
Men	120	14	3
Women	80	11	2

1. Calculate the overall average length of service for workers based on sample data.
2. With a probability of 0.954, determine the confidence limits of the average length of service of workers in the general population.

Problem 12

A mechanical sample of 150 bulbs from a finished product batch was tested for burn time. The last bulb burned for 670 hours, with a standard deviation of 70 hours.

Define:

- 1) the average error (μ) of the sample average duration of the light bulb burning;
- 2) with a probability of 0.97, the confidence limits of the duration of burning of a light bulb in the general population.

Problem 13

From a batch of finished products, 320 items were checked using mechanical, non- repeated sampling and it was established that 75% of them correspond to the first grade.

With a probability of 0.95, determine the share (percentage) of first-grade products in the entire batch.

The problem can be solved in two ways:

- 1) the number of items in a batch of finished goods is unknown;
- 2) there are 1000 items in a batch of finished products.

Questions for the exam .

1. Tasks of economic statistics.
2. Statistical observation. The purpose of statistical observation.
3. Object of statistical observation. Unit of statistical observation. Statistical observation program.
4. What specially organized statistical observations do you know?
5. How can non-continuous observations be carried out?
6. Methods of recording statistical observations.
7. What is grouping and what does it mean in statistics?
8. By what criteria can distribution series be formed? Examples.
9. What is a statistical table?
10. How do statistical tables differ by subject?
11. What errors can occur during statistical observation?
12. What are the basic requirements for the construction and design of a statistical table?
13. What quantities are called absolute in statistics? What are the units of measurement for absolute quantities?
14. What are relative quantities? Name the types of relative quantities.
15. What is the purpose of statistical graphs?
16. What types of average values do you know?
17. Variation indices. Absolute and relative variation indices.
18. What is trait variation ? What determines its size?
19. What is the range of variation of a trait?
20. What is feature variance?
21. What measures of relative dispersion are used in statistics?
22. How is the coefficient of variation calculated and what is its significance for economic analysis?
23. Forms, types of statistical relationships.
24. What are the main tasks solved using correlation and regression analysis?
25. What is the significance of a regression equation? What do the regression coefficients characterize?
26. How is the significance of regression coefficients tested?
27. How to check the adequacy of the equation as a whole?
28. What are the basic rules for constructing a multifactorial correlation model?
29. How to economically interpret a multivariate regression model ?
30. How is the statistical significance of the parameters of a regression equation assessed?
31. A measure of the strength of a statistical relationship. Correlation coefficient .
32. index , contingency coefficient, association coefficient .
33. Rank coefficients.
34. What observations are called sample observations ?
35. How is random selection done?

36. How is mechanical selection carried out?
37. How is type selection carried out?
38. How is serial selection carried out?
39. How is marginal sampling error calculated?
40. What types of time series exist?
41. What dynamic series are called moment series and why cannot their levels be summed?
42. What series of statistical quantities are called interval series? Why can their levels be summed? Give examples.
43. What techniques are used to transform incomparable time series into comparable ones?
44. What is the essence of the interval enlargement method and what is it used for?
45. How is time series smoothed using a moving average? What are the advantages and disadvantages of this method?
46. What is the essence of the method of analytical alignment of dynamic series?
47. How to determine the type of the dynamics trend equation?
48. What are seasonal fluctuations and what is the practical significance of studying them?
49. What is called an index in statistics?
50. What do individual indices characterize? Give examples.
51. How are aggregate price indices (Paasche and Leipseyres) calculated?
52. What is called a variable composition index, how is it calculated and what does it characterize?
53. What index is called the index of constant composition, how is it calculated and what does it characterize?
54. What does the structural break index characterize and how is it calculated?
55. How is the aggregate index of production costs calculated and what does it characterize?