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ФИО: Порохня Андрей Алексеевич
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MINISTRY OF SCIENCE AND HIGHER EDUCATION
OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution
higher education "NORTH CAUCASUS FEDERAL UNIVERSITY"

APPROVE

Acting Director of the Institute,
Candidate of Technical Sciences,
Associate Professor A.A. Porohnia

ASSESSMENT TOOLS FUND FOR DISCIPLINE

Statistical analysis

name of the discipline

Direction of training	09.04.03 Applied Informatics Knowledge
Focus (profile) Year of	Management
commencement of studies	2026
Form of study	full-time
Implemented in a semester	1

Introduction

1. Purpose: FOS is intended for an objective assessment of the level formation of competencies.

2. FOS is an appendix to the program of the discipline "Statistical Analysis / Statistical analysis»

3. Developer Amirokov S.R., associate professor.

4. An examination of the FOS was carried out. Members of the expert group:

Chairman Azarov I.V., Acting Director of the Department

Members of the commission:

Amirokov S.R., Associate Professor of the Department

Orlinskaya O.G., Associate Professor of the Department

Representative of the employer organization Cherevko S.A., General Director of KRAFTKOD LLC *(Full name, position)*

Expert opinion: FOS for the discipline allows to assess the level of formation of competencies. Proceed to testing.

5. The validity period of the FOS is determined by the period of implementation of the educational program.

1. Description of the criteria for assessing competence in various stages of their formation, description of assessment scales

Levels formation and competencies, indicator(s)	Descriptors			
	Minimum level not achieved (Unsatisfactory But) 2 points	Minimum level (satisfactory) O) 3 points	Intermediate level (Fine) 4 points	High level (Great) 5 points
UK-6				
ID-1 UK-6. reaches result by way self-development.	With difficulty reaches result by self-development	Reaches result by self-development is not in full	Overall it reaches result by self-development	reaches result by self-development
ID-2 UK-6. uses methods goal setting.	Uses with difficulty methods goal setting	Uses little methods goal setting	Generally uses methods goal setting	uses methods goal setting
OPK-3				
ID-1 OPK-3. analyze professionally you information, and introduce V view analytical reviews justified conclusions recommendations;	With difficulty analyzes professional information, and represent in the form analytical reviews with justified conclusions and recommendations	Weak analyzes professionally you information, and represent in view analytical reviews with justified conclusions and recommendations	Mostly analyzes professionally you information, and represent in view analytical reviews with justified conclusions and recommendations	analyzes professionally you information, and represent in view analytical reviews with justified conclusions and recommendations
ID-2 OPK-3. highlight professionally you information The main thing introduce V view analytical reviews justified conclusions recommendations.	It is difficult to distinguish in a professional setting information main and represent in the form of analytical reviews with justified conclusions and recommendations	It is weakly secreted in professional information the main thing and represent in view analytical reviews with justified conclusions and recommendations	Mostly highlights in professional information the main thing and represent in view analytical reviews with justified conclusions and recommendations	highlights in professional information the main thing and represent in view analytical reviews with justified conclusions and recommendations
PC-3				
ID-1 PC-3. develop fundamental And interdisciplinary knowledge	Cannot develop fundamental and interdisciplinary knowledge	Allows serious mistakes V developme nt fundamental And interdisciplinary knowledge	Mostly accurate develops fundamental And interdisciplinary knowledge	develops fundamental And interdisciplinary knowledge
ID-2 PC-3. Develop methods scientific research	Develops with difficulty scientific methods research	Allows serious mistakes V developme nt methods scientific research	Mostly accurate develops methods scientific research	develops methods scientific research
PC-6				

ID-1 analyze subject	PC-6. With difficulty analyzes subject	Weak analyzes subject	Generally analyzes subject	analyzes subject region,
region, identify And describe problems, find methods and approaches to them solution; to form requirements	region, identifies and describes problems, finds methods and approaches to their solution; forms requirements	region, identifies and describes problems, finds methods and approaches to them solution; forms requirements	region, identifies and describes problems, finds methods and approaches to them solution; forms requirements	identifies and describes problems, finds methods and approaches to them solution; forms requirements
ID-2 Identified ь, classify And describe problems subject areas, find methods and approaches to their solution.	PC-6. With difficulty identifies, classifies and describes problems subject area, finds methods and approaches to them solution.	Weak identifies, classifies and describes problems subject areas, is located methods and approaches to their solution.	Generally identifies, classifies and describes problems subject areas, is located methods and approaches to their solution.	identifies, classifies and describes problems subject areas, is located methods and approaches to their solution.

The assessment of the level of development of competence in the discipline is carried out on the basis of the “Regulations on the current monitoring of academic performance and midterm assessment of students in higher education programs - bachelor's degree programs, specialist programs, master's degree programs - at the federal state autonomous educational institution of higher education "North Caucasus Federal University" in the current version.

ASSESSMENT TOOLS FOR CHECKING THE LEVEL OF COMPETENCY DEVELOPMENT

Number tasks	Correct answer	Contents of the question	Competence
		Full-time education, semester 1	
1.		A factor in a one-way ANOVA problem is called	UK-6
2.	2	(1) the value of the measured characteristic (2) a variable that influences the value of the measured characteristic (3) error of the measured feature	UK-6
3.	1,2	Variable X is measured on a quantitative scale. The results of measurements of this variable (1) can be represented on an ordinal scale of measurements (2) can be represented on a nominal scale of measurement (3) cannot be represented on any other scale of measurement	UK-6
4.	3	Features X and Y are measured on a nominal scale. What criterion can be used to test the hypothesis of independence of these features? (1) Spearman's rank test (2) Kendal's rank criterion (3) Fisher-Pearson chi-square test (4) criterion based on the sample correlation coefficient	UK-6
5.	2	The problem of one-way analysis of variance is a generalization of the problem of testing the hypothesis that two samples are homogeneous against the alternative that the samples in question differ (1) scale parameter (2) shift parameter (3) distribution type	UK-6
6.	1	One hundred (100) students were tested in calculus and physics. Let variable X be the students' calculus rating, and variable Y be the students' physics rating. Spearman's correlation coefficient for the variables X and Y were found to be equal to 0.6. This information (1) allows us to conclude at a significance level of 0.05 that there is a monotonic positive relationship between the indicators X and Y (2) allows us to conclude at a significance level of 0.05 that there is a difference between the indicators	UK-6

		There is a monotonic negative relationship between X and Y (3) allows us to conclude that at a significance level of 0.05 there is no reason to reject the hypothesis of independence of the indicators X and Y (4) does not allow us to draw a conclusion about the dependence or independence of indicators X and Y	
7.	1	During the experiment, a two-dimensional sample was realized. It is known that the first observation is (5;3), and the second is (3;1). We can say that these pairs (1) agreed (2) not agreed upon (3) correlated (4) uncorrelated	UK-6
8.	2	The problem of multicollinearity in a linear regression model is caused by the following circumstance (1) the presence of a linear relationship between the output (resulting) variable and the input (explanatory) variables (2) the presence of a linear relationship between the input (explanatory) variables (3) errors have different variances	UK-6
9.	1	The problem of two-factor ANOVA is considered. The main (tested) hypothesis is that (1) the main factor does not affect the response (2) the interfering factor does not affect the response (3) both the main and interfering factors do not affect the response	UK-6
10.	3	Each of the n objects has a large number of measured indicators. It is necessary to move to a space of indicators of lower dimensionality without violating the essential structure of the data. Such a compression procedure is possible (1) always (2) in case of uncorrelated indicators (3) in case of strong correlation of indicators	UK-6
11.	1	The response in a one-way ANOVA problem is (1) the value of the measured feature (2) a variable that influences the value of the measured characteristic (3) error of the measured feature	UK-6
12.	2	Variable X is measured on an ordinal scale. The results of measurements of this variable (1) can be presented on a quantitative scale of measurements (2) can be represented on a nominal scale of measurement (3) cannot be represented on any other scale of measurement	UK-6

13.	1	Variable X is measured on a nominal scale, and variable Y is measured on a quantitative scale. It is required to find out whether these variables are independent. In order to solve this problem, one can (1) transform the Y variable into a nominal variable and apply the chi-square test (2) transform variable X into a quantitative variable and apply the test to test the independence of quantitative variables (3) apply the Kolmogorov-Smirnov criterion	UK-6
14.	2	During the experiment, a two-dimensional sample was realized. It is known that the first observation is (7;3) and the second is (3;5). We can say that these pairs (1) agreed (2) not agreed upon (3) correlated (4) uncorrelated	UK-6
15.	2	A necessary condition for the application of the Page criterion in the problem of two- factor analysis of variance is (1) Gaussianity of observations (2) a priori information that as the level of the main factor increases, the mean value of the response will increase (3) a priori information that as the level of the interfering factor increases, the mean value of the response will increase	UK-6
16.	Statistical regularity - objective regularity complex mass process, it is form manifestations causal connection ns. Statistical regularities are discovered on basis mass statistical	What is a statistical pattern?	UK-6

	observations. This is conditioned by her connection with the law large numbers.		
17.	Statistical totality - This set existing in time and space varying phenomena, of the same quality (homogeneous) By certain sign. This Maybe be totality residents cities, student population university, And etc. Statistical totality is object statistical study.	What is a statistical population? Give an example.	UK-6
18.	By character expressions: - quantitative – are expressed by numbers (employee length of service, number of tourists, etc.); - quality (attributive) - not have numerical expressions,	Provide a classification by the nature of expression. Example.	UK-6

	represent by yourself semantic concepts and are expressed verbally (form of ownership, employee's gender, etc.).		
19.	By relation to time: - moment - characterize studied object V some moment time (number tourists, price fixed assets); - interval - characterize results of processes over a time interval: day, month, year, etc. (sales volume, number of employees employees).	Provide a classification in relation to time. Example.	UK-6
20.	By character variations: - discrete – quantitative signs that do not have intermediate values between separate values numerical series (number tourists groups, quantity travel agencies cities);	Provide a classification by the nature of variation. Example.	UK-6

	- continuous - accept any values from given range. As a rule, these are calculated values (profitability, rate growth in sales volume); - alternative – can only accept two values (presence or absence certain properties). For example, floor employee (male or female)		
21.	Subject of research statistics - mass social- economic phenomena and processes. Statistics studies quantitative side of these phenomena in an inextricable connection with their qualitative content V specific conditions places and time. Quality side phenomena characterized by similarity of units By any	What is the subject of statistical study?	UK-6

	high quality signs (For example, floor affiliation enterprises To certain industries economy).		
22.	Method statistics Can describe several in words: this is a collection, a generalization, presentation, analysis and interpretation data. However, because statistics studies set social-economic phenomena and the patterns characteristic of the method, its method statistics represents by yourself kiss totality receptions, taking advantage of which statistics explores his subject.	What is the statistical method?	UK-6
23.	Statistical sign - characteristic property defined quality statistical aggregates. For example, statistical	What is called a statistical feature?	UK-6

	signs enterprises can be: form property, number working, size statutory capital, value of assets, etc. Meaning sign separate units statistical aggregates is called a variant.		
24.	Statistical the indicator is, quantitatively - high quality characteristic of some property of a group units of the population or a set in as a whole. Unlike the sign statistical indicator receive calculated by way. Volume products enterprises per month, annual volume foreign trade turnover - statistical indicator.	What is called an indicator, a system of indicators in statistics?	OPK-3

	Statistical indicators are determined by way of summation of absolute values of feature (number population, unemployed, labor resources), calculations of medium values of signs (average salary, average income per capita), relative quantities (cost index, growth rates). Statistical system of indicators are totality of interconnected indicators, having single-level or multi-level structure and targeting to solve a specific statistical problem.		
25.	Statistical observation is mass, systematic, scientifically organized observation for phenomena social	The concept of statistical observation	OPK-3

	and economic life, which consists of registration selected features in each units aggregates.		
26.	Process conducting statistical observations include the following stages: - Preparation observations; - conducting mass data collection; - preparation of data for automation processing; - development offers By improvement statistical observations.	Stages, forms, types and methods of statistical observation	OPK-3
27.	Errors statistical observations - This discrepancies between established statistical observation And valid the values of the studied quantities. Types of errors:	Errors of statistical observation	OPK-3

	- errors registration arise as a result unfaithful, erroneous registration of facts; - random mistakes arise as a result different random reasons, no having strict directions; - systematic mistakes - mistakes registration, emerging in force certain An constantly active on throughout process statistical observations of causes V in one direction: A) intentional systematic mistakes arise as a result of what the respondent consciously represents to the registrar unfaithful data. b) unintentional systematic mistakes wear random,		
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	unintentional character. - mistakes - representativeness - discrepancies between the values of the studied feature in the selected and examined - selective aggregates - values in all aggregates: A) - random mistakes - representativeness - arise as a result of - of non-continuous nature - statistical observations - systematic - mistakes representativeness - result - deliberate - biased selection - units from the general aggregates, which should be subjected to observation.	d d	
28.	IN practical statistics wide applies method classifications An	Classification and grouping as a method of processing and analyzing primary statistical information d	OPK-3

	groups. Classification - This systematic distribution phenomena and objects By certain groups, classes, categories on based on their similarities and differences. For further processing of collected in in the course of statistical primary observations data wide use Andmethod groups. Grouping - This distribution sets units under study aggregates By groups according to with significant for given groups sign.		
29.	Method groups allows to provide primary generalization data, performance their V more ordered view. Thanks to grouping Can correlate	Basic techniques for constructing and performing groupings	OPK-3

	summary indicators for aggregates generally with summary indicators By groups. Appears opportunity compare, analyze the reasons differences between in groups, study interrelations between signs. Grouping allows conclude O structure of the population and about the role of individual groups this aggregates. Exactly the group forms basis For subsequent summary and data analysis.		
30.	Signs by which is being carried out grouping, they call grouping signs. Grouping sign Sometimes they call basis groups. Correct choice essential	Types of Groupings. Statistical Table	OPK-3

	grouping sign opportunity scientifically based conclusions based on the results statistical research. Grouping signs may have as quantitative expression (volume, income, rate currencies, age, etc.), as well as quality (form property enterprises, floor a person, industry affiliation, An marital status etc.).		
31.	A	A variation series is a distribution series constructed according to ... a feature a) quantitative b) qualitative c) continuous d) quantitative and qualitative	OPK-3
32.	A	The average value of the feature is 20, and the coefficient of variation is 25%. The variance of the feature is a) 25 b) 50 c) 20	OPK-3
33.	A	Fashion is called...	OPK-3

		a) the most frequently occurring value of a feature in a given series b) the value of a feature that divides a given population into two equal parts c) the average value of a feature in a given distribution series	
34.	A	When all values of the feature are increased by 2 times, the arithmetic mean.... a) will increase by 2 times b) will increase more than 2 times c) will decrease by 2 times	OPK-3
35.	A	Grouping industrial enterprises by type of ownership is an example of grouping: a) typological b) structural c) complex	OPK-3
36.	A	Absolute variation rates:.... a) range of variation b) coefficient of variation c) correlation coefficient	OPK-3
37.	A	The physical volume of production decreased by 20%, and production costs increased by 6%. The unit cost index = ...% (with an accuracy of 0.1%). a) 132.5 b) 96.5 c) 88.3	OPK-3
38.	A	If all values of a feature are increased by 16 times, then the dispersion... a) will increase by 256 times b) will increase 16 times c) will increase 4 times	OPK-3

39.	b	A time series is called:..... Choose one answer. a) Temporarily created data set b) Time-ordered values of the indicator c) A series of data obtained by calculation in a short period of time d) Research data set	OPK-3								
40.	b	The mode of the variation series 1, 2, 2, 3, 2, 5 is equal to ... a) 1 b) 2 c) 3 d) 4 e) 5	OPK-3								
41.	a	The mode of the variation series 1, 1, 1, 1, 2, 3, 4, 5 is equal to ... a) 1 b) 2 c) 3 d) 4 e) 5	OPK-3								
42.	c	The sample mean of the variation series 1, 2, 2, 3, 3, 3, 4, 6 is equal to ... a) 1 b) 2 c) 3 d) 4 e) 5	OPK-3								
43.	b	The distribution of a sample of size $n=10$ is given. <table border="1"> <tr> <td>x_i</td><td>- 513</td><td></td><td></td></tr> <tr> <td>The sample mean is $\bar{x}$</td><td>253</td><td></td><td></td></tr> </table> a) 0.2	x_i	- 513			The sample mean is $\bar{x}$	253			
x_i	- 513										
The sample mean is $\bar{x}$	253										

		b) 0.4 c) 0.6 d) 0.8									
44.	a	Discrete the random variable X is given by a certain distribution one <table border="1"> <tr> <td>X</td><td>- 1</td><td>0</td><td>3</td></tr> <tr> <td>P</td><td>0.1</td><td>0.3</td><td>0.6</td></tr> </table> Then the mathematical expectation of this random variable is equal to. a) 1.7 b) 3.4 c) 5.1 d) 2.1 e) 4.2	X	- 1	0	3	P	0.1	0.3	0.6	
X	- 1	0	3								
P	0.1	0.3	0.6								
45.	c	Four measurements (without systematic errors) of some random variable (in mm) are carried out: 6; 7; 8; 11. Then the unbiased estimate of the mathematical expectation is equal to ... a) 6 b) 7 c) 8 d) 11									
46.	a	The distribution of a sample of size $n=10$ is given, the sample mean of which is 2.6. Then the value of m is ... <table border="1"> <tr> <td>x_i</td><td>m</td><td>3</td><td>4</td></tr> <tr> <td>n_i</td><td>3</td><td>5</td><td>2</td></tr> </table> a) 1 b) 2 c) 3 d) 4	x_i	m	3	4	n_i	3	5	2	
x_i	m	3	4								
n_i	3	5	2								

		e) 5	
47.	a	It is possible to implement two new projects associated with risk. The first project promises to receive a profit of 15 million USD with a probability of 0.4, but does not exclude a loss of 2 million USD. The second project promises a profit of 10 million USD with a probability of 0.5; the possible loss here may amount to 8 million USD. Which project is preferable in terms of expected profit and find the difference in their mathematical expectations. a) second; 1.8 b) first; 0.6 c) are equivalent; 0 d) second; 0.8 e) first; 0.3	
48.	a	The probability of failure of a part during a reliability test is 0.2. Find the mathematical expectation of the number of failed parts if 10 parts are subjected to testing. a) 2 b) 3 c) 1 d) 4 e) 0	
49.	a	A dice is thrown 3 times. Find the probability that a six appears three times. $\frac{1}{216}$ a) $\frac{1}{216}$ $\frac{7}{216}$ b) $\frac{1}{216}$	

		$\frac{1}{c)_{72}}$ $\frac{1}{d)_{36}}$	
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