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The Importance of Teaching Probability and Mathematical Statistics to Economics

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Abstract:

The training of specialists in the field of economics is directly related to the study of economic sciences as well as mathematical sciences, in particular, the mastering of probabilistic statistical methods in order to develop their professional competence. In this article, the relevance of teaching probability theory and mathematical statistics based on the concept of "practical-professional orientation" is based, and the mechanisms of implementation of this process are cited together with an example.

Keywords: theory of probabilities, mathematical statistics, economics, practical-professional issues, problematic practical-professional issues.

The training of economists in higher education institutions, the development of their professional competence is directly related to the study of economic sciences, as well as mathematics, in particular, with the development of probabilistic-statistical methods. Internal and external variability, i.e. variations, in each economic process are studied on the basis of the signs of variation of these socio-economic phenomena, and the laws of their development are determined by probability theory and methods of mathematical statistics. Analytical conclusions are assessed with a certain degree of probability, which means that the results of a certain examination can lie within certain limits, are reliable. Probability theory and mathematical statistics describe socio-economic phenomena with their methods and serve to determine the laws of change of the process under study on the basis of statistical data, usually consisting of numbers.

Panina N.V., Elenkin A.G., Aleksandrova E.V., Konovalova I.N., Dolgopolova R.Sh. A number of studies were conducted by Khusnutdinov, E.Abdullaev, N.M.Soatov and others. Mathematical education begins with organic and consistent practical experience and exercises and moves on to abstract concepts. Professional experience is formed in practice. In this sense, the "practical and

professional focus of training" is of particular importance in the study of theory probability and mathematical statistics.

We believe that the content and structure of practical and professional questions for economists should meet the following didactic and methodological requirements:

- the probabilistic-statistical problem corresponds to the studied subject of mathematics, is relevant to the current dynamics of production development, contains information about the profession;
- the text of the question should be as short and clear as possible, it should be aimed at the formation of systematic and consistent practical problems and solving real life problems on this basis;
- compliance with the trend of formation of professionally important knowledge, skills and qualifications that contribute to the development of professional competence of future economists;
- the emergence of technical capabilities when performing calculations to obtain numerical results, the use of special programs Excel, MathCad, Statistics and similar technical means of calculation.

Practical and professional questions should not serve the study of a large volume of educational material, but rather a deepening of the understanding of probabilistic and statistical terms and facts, the formation of the potential for applying theoretically acquired knowledge in professional activities.

We have divided the problems of probability theory and mathematical statistics for economists into the following three types depending on the way they are presented.

1. Purely mathematical problems. Purely mathematical problems that can be solved using mathematical formulas and concepts based on a strict algorithm. We can say that the methods for solving such problems are ready, and in practice they are not aimed at the profession.
2. Practical and professional questions. Mathematical problems related to professional activities. A solution method has been developed for practical and professional problems, and to solve it, comparing the necessary values requires only a small mental effort. As a result of solving this problem, professional competence develops to a certain extent through the use of appropriate calculation formulas.
3. Problematic practical and professional questions. The problem is not formulated in mathematical language, but is presented as a task. In this case, it is necessary to solve the required problem, this is done through some practical activity, and as a result, a mathematical form of the problem is formed. It is necessary to find answers to a number of questions in problematic practical professional issues. How to collect initial data, what to analyze when processing them, what mathematical formulas to use, etc. Undoubtedly, such questions are most useful from the point of view of developing professional competence, from which understanding and solving a problem situation begins.

Here are some examples of problematic practical and professional questions.

Problem: Ask each student to create a series of events and determine the meaning of these combinations of events.

Example: Brand of "Avicenna's Lab" advertises "Laktovit" products in three different ways: on television, through advertising banners and through Internet sites. Taking the risk of choosing one of the customers who came to buy the company's products, we will mark the event of viewing the

advertisement on television as A_1, the event of viewing it through advertising banners as A_2, and the event of viewing the advertisement through Internet sites with A_3.

Explain the following events:

a) $\bigcap_{i=1}^{3} A_i$, b) $\bigcup_{i=1}^{3} A_i$, c) $\bigcup_{i=1}^{3}(A_i \cap (\bigcap_{j\neq i} \overline{A}_j))$,

d) $\bigcup_{i_1\neq\ldots\neq i_n} A_{i_1} \cdot\ldots\cdot A_{i_k} \cdot \overline{A_{i_{k+1}}} \cdot\ldots\cdot \overline{A}_{i_n}$, $(1 \le k \le 3)$

Solution:

a) $\bigcap_{i=1}^{3} A_i$ - risking that the selected client will see all the advertising;

b) $\bigcup_{i=1}^{3} A_i$ - the risk of which the selected client saw at least one advertisement;

c) $\bigcup_{i=1}^{3}(A_i \cap (\bigcap_{j\neq i} \overline{A}_j))$ - risking that the selected client will see one ad;

d) $\bigcup_{i_1\neq\ldots\neq i_n} A_{i_1} \cdot\ldots\cdot A_{i_k} \cdot \overline{A_{i_{k+1}}} \cdot\ldots\cdot \overline{A}_{i_n}$, $(1 \le k \le 3)$ - The risk is that the selected client will see exactly k ads.

Problem: An entrepreneur buys different products from several companies and sells them in his stores. To reduce transportation costs, he wants to sell only one company and terminate the contract with the others. Develop a strategy to determine which companies are best to maintain relationships with.

Example: The entrepreneur opened minimarkets in two places. Sausage products are brought and sold at the 1st minimarket from the company "To'xtaniyoz Ota". Sausage products from the company "Sharshara" are sold at the 2nd minimarket. The businessman calculated that if instead of two companies the products are brought from one company, the transportation costs will be reduced by 1 200 000 $ per month. The daily profit from the sale of sausages for the last month was recorded:

Date	Profit 1st minimarket (*10^3 $)	Profit 2nd minimarket (*10-^{3}$)	Date	Profit 1st minimarket (*10^3 $)	Profit 2nd minimarket (*10-^{3}$)
1	150	120	**16**	185	152
2	152	130	**17**	140	154
3	154	154	**18**	160	150
4	150	150	**19**	170	260
5	160	160	**20**	180	300
6	190	230	**21**	130	20
7	125	80	**22**	180	30
8	148	140	**23**	160	150

9	140	152	**24**	155	250
10	154	154	**25**	150	400
11	155	72	**26**	170	60
12	170	260	**27**	185	20
13	202	230	**28**	130	220
14	130	120	**29**	160	150
15	170	150	**30**	165	152

Based on this information, which company's products should the entrepreneur continue to sell?

Solution: First of all, let's calculate the average daily profit (average sample) in each minimarket:

$$\overline{x_T} = \frac{150+152+154+...+165}{30} = 159$$

$$\overline{y_T} = \frac{120+130+...+152}{30} = 159$$

The average profit is the same. Now let's calculate the standard deviation. To do this, we first calculate the sample variances:

$$D_x = \frac{(150-159)^2+(152-159)^2+...+(165-159)^2}{30} = 348,8$$

$$D_y = \frac{(120-159)^2+(130-159)^2+...+(152-159)^2}{30} = 6807,1$$

$$\sigma_x = \sqrt{D_x} = 18,7$$

$$\sigma_y = \sqrt{D_y} = 82,5$$

Thus, the products of the company "To‘xtaniyoz Ota" bring more stable profit than the products of the company "Sharshara". Therefore, it is better to continue trading the products of the company " To‘xtaniyoz Ota".

We believe that practical and professional problems can be solved in three stages:

Stage 1. At this stage, the condition and conclusion of the given issue are identified, its content and essence are clarified. It is determined what needs to be found, after dividing the condition and conclusion of the problem, specific practical actions are determined. After this, the problem is clothed in mathematical form.

Stage 2. At this stage, the main attention is paid to planning and choosing a method for solving the problem. It is determined what additional information is necessary for its application, a solution plan is determined and implemented step by step. At this stage, if the information provided is sufficient to solve the problem, a solution method is selected. If the information is insufficient, it is determined what additional information is needed, and then a plan for solving the problem is developed. Based on this, they gradually approach the correct solution.

Stage 3. At this stage, the problem is solved based on the intended plan, errors are identified and corrected, and the solution is directly verified. At this stage, students, based on experience and practice, understand the essence of professional issues and the importance of probabilistic and statistical methods.

Of course, when solving all types of problems, students should be able to apply certain properties, theorems and their results, and be able to use various methods.

When solving problems, it is necessary to pay attention to the following:

- know and remember the basic concepts, definitions, properties and formulas of probability theory and mathematical statistics;
- be able to plan your activities when solving problems and determine ways to solve a problem using mathematical concepts;
- must understand the essence of this issue.

The above methodological recommendations should be used at all stages of the process of solving practical and professional problems: understanding the essence of the problem and taking the necessary practical actions, planning, solving and checking the problem.

Explaining the course of probability theory and mathematical statistics to students of economic specialties using problematic practical and professional problems will help them develop economic thinking, solve problems that arise in work, plan future activities in the economic sphere. deposits, predict, be fully prepared in conditions of uncertainty, help to make a good conclusion.

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