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PROBABILITY THEORY AND WORKING WITH ELEMENTS OF MATHEMATICAL STATISTICS

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Mathematical statistics is a science that studies the methods of collecting statistical data, systematizing, processing, and drawing scientific and practical conclusions from the data. Statistical data means information about the number of elements of sets with certain (quantitative) characteristics. This method is widely used in many fields of science. In this article, we discuss the elements of mathematical statistics and explain its role and importance in our daily life through some examples.

Keywords: Statistics, situation, situation, mass random events, observation,results, description, collection, systematization, analysis, interpretation, method, random quantity, experiments, distribution function, evaluation, mathematical statistics, tasks, statistical hypotheses, hypothesis theory, sample set, set size, parametric estimation theory.

INTRODUCTION

The science of probability theory and mathematical statistics are inextricably linked with each other, the first of which studies the probabilistic laws of mass random events, and the second examines the laws to which these random events are subject by experiments collected and studies statistical data for the purpose of identification. The first task of mathematical statistics is to show the method of collecting and grouping statistical data, and its second task is to develop methods of statistical data analysis.

MATERIALS AND METHODS

The word statistics means state of a situation. Mathematical statistics serves as a mathematical apparatus for the analysis of natural processes of public and social nature. Russian mathematicians in the 20th century such as Romonovskiy (1971), Kolmogorov (2018), Pugachev (1979); English scientists: Stgyudent, R. Fisher, E. Pearson; American scientists: Yu. Neiman, A. Valgd and Uzbek scientist Sirojiddinov (1982), as well as his students made a great contribution to the development of the science of mathematical statistics.

Thus, the task of mathematical statistics is to collect statistical data and create methods of their development in order to make scientific and theoretical conclusions.

Elements of combinatorics play an important role in solving problems using the classical definition, taking into account that; we will dwell on some elements of combinatorics.

1. Number of permutations: permutations made from m (n ≥ m) elements of n elements are called all such associations (groups) that each of these associations has m elements, and they are separated from each other either by elements or differs in the order of the elements. For example, placements made by taking 2 out of 3 elements a, b, c:

ab, ac, ba, bc, ca, cb

will be.

The number of all permutations of *n* elements from *m* is denoted by the symbol and determined by the formula.

$$A_n^m = n(n-1)(n-2)\ldots(n-m+1)$$

Thus, the number of all permutations that can be made by subtracting *m* from *n* elements is equal to the product of m consecutive integers, the largest of which is *n*. For example,

$$A_{10}^4 = 10 \cdot 9 \cdot 8 \cdot 7 = 5040$$

1. The number of substitutions. Unions that include all *n* given elements and differ only in the order of the elements are called permutations. For example, 6 different permutations can be made from 3 elements a, b, c:

abc, acb, bac, bca, cab, cba

It is accepted to designate the number of permutations that can be made from *n* elements with a symbol. A permutation can be considered as a permutation in which the elements included in each permutation are equal to the number of all elements, that is, m=n. This gives the following formula for the number of all permutations made up of n elements:

$$P_n = A_n^n = n(n-1)(n-2)...(n-(n-1))$$

or if we write the multipliers in reverse order, below formula will be created

$$P_n = A_n^n = 1\cdot 2\cdot ...(n-2)(n-1)n = n!$$

So, the number of all arrangements that can be made from *n* elements is equal to the product of consecutive natural numbers from 1 to *n* (n included). For example,

$$P_5 = 5! = 1\cdot 2\cdot 3\cdot 4\cdot 5 = 120$$

The number of groupings is groupings formed from m elements from n elements, each of which is formed from m different elements and differs from each other by at least one element. For example, if we take 3 groups from 4 elements a, b, c, d, they will be 4 in total:

abc , abd , acd , bcd

The number of groupings formed by taking m from n elements

C_n^m is adopted and was determined by this formula

$$C_n^m = \frac{A_n^m}{P_m} = \frac{n(n-1)(n-2)...(n-m+1)}{1\cdot 2\cdot 3\cdot ...\cdot n} \quad (1)$$

(1) By multiplying and dividing the right side of the equation by (n-m)!=1·2·3·…·(n-m), the formula for finding the number of groupings is different, and can be written as

$$C_n^m = \frac{n!}{m!(n-m)!} \quad (1`)$$

If we replace m number with n-m number in this formula, then

$$C_n^{n-m} = \frac{n!}{(n-m)!m!}$$ (2) formula is formed.

The right sides of formulas (1`) and (2) are equal to each other, so their left sides are also equal, i.e.

$$C_n^m = C_n^{n-m} \quad (3)$$

m=n, then from formulas (1`), (2) and (3) we get the following:

$$C_n^n = \frac{n!}{n!0!}, \quad C_n^0 = \frac{n!}{0!n!} \text{ va } C_n^n = C_n^0$$

$C_n^n = 1$,

Because, only one grouping of n elements can be formed from n elements. Therefore, to confirm the correctness of the above equations

$$C_n^0 = 1 \text{ va } 0! = 1$$

Example 1. Find number of groupings formed by subtracting 4 of the 10 elements.

Solution: (1) we use this formula , $C_{10}^4 = \frac{10\cdot 9\cdot 8\cdot 7}{1\cdot 2\cdot 3\cdot 4} = 10\cdot 3\cdot 7 = 210$

Example 2. Find the number of groups formed by subtracting 17 of the 20 elements.

Solution: First we use formula (3), then formula (1):

$$C_{20}^{17} = C_{20}^{20-17} = C_{20}^3 = \frac{20\cdot 19\cdot 18}{1\cdot 2\cdot 3} = 20\cdot 19\cdot 3 = 1140$$

1. In how many different ways can the white and black kings be placed on the chessboard without breaking the rules of the game?

Hint: Look at the 3 cases:

1) the white king stands in the corner;
2) the white king stands on the edge (but not in the corner) of the board;
3) the white king is not on the edge of the board.

Solution: 1. 4·60=240
2. 24·58=1392
3. 36·55=1980

2. There are white and black balls in the bowl. If we take one black ball out of it, the number of white and black balls will be equal. If we take out one white ball, there will be twice as many white balls as black balls.

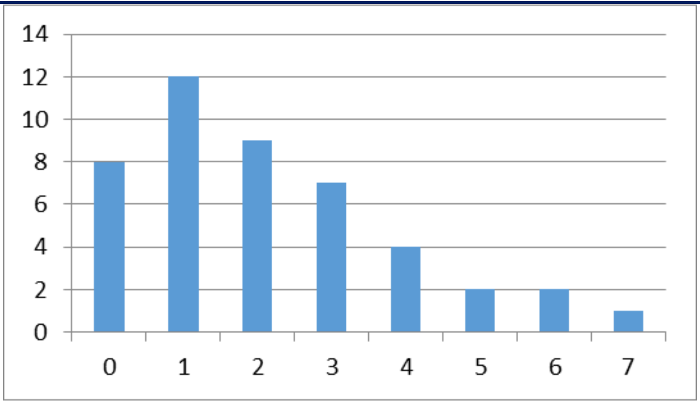
Solution: x-black
y-white
x-1=y
2(y-1)=x
2(x-1-1)=x
2(x-2)=x
X=2x-4
-x=-4
X=4
Y=3

RESULTS AND DISCUSSION

In practice, various methods of selection are used, and they are mainly divided into two types:
1. Selection of the main set without dividing it into parts, which includes:
a) simple irreversible random selection;
b) simple reversible random selection.
2. Selection of the main set after disassembly, which includes:
a) typical selection;
b) mechanical selection;
c) serial selection.
Simple random selection is the selection of elements from the population.
A typical selection is a selection in which such objects are not taken from the entire main set, but from its "typical" parts. For example, if the parts are made on several machines, then the selection is made not from the entire set of parts, but some of the products of each machine.
3.How many 5-digit numbers can be formed from the numbers 1 to 9? The solution of the problem is represented by which formula of combinatorics?
Solution: 1,2,3,4,5,6,7,8,9
9·9·9·9·9=59049
Answer: from the multiplication formula.
4. How many different pairs can be made by taking one of four different bolts and three different nuts?
Solution: 4•3=12
Answer: from the multiplication formula.
5. In how many ways can 1 goalkeeper, 2 strikers, 2 midfielders be selected from 11 members of the football team?
Solution: 1 out of 11. 11
2 out of 10. 10•9=90
2 out of 8. 8•7=56
11•90•56=55440.
Answer: from the multiplication formula.
6. In how many ways can 6 volleyball players be selected from 20 athletes?
Solution: 6 out of 20

$$\frac{20\cdot19\cdot18\cdot17\cdot16}{6!\cdot14!}=38760$$

Answer: from the placement formula
7. Muhammadjon has as many sisters as there are brothers. The number of brothers of the older sister is 2 times more than the number of sisters. How many boys and how many girls are there in this family?
Solution: y is a boy
x is a girl
y-1=x 2(x-1)=y y=x+1
2x-2=x+1
x=3
y=4
8. A marketer asks randomly selected people, "How many times have you been to the store this week?" addressed the question and described the results of the survey as follows:
a) How many people participated in the survey?
b) Which option is the most common? What can be concluded?
c) How many people did not go to the store this week?
d) What percentage of people entered the store more than 3 times?
e) Make a frequency table.
Frequency



Entry number
n=8+12+9+7+4+2+2+1=45; 45 people;
a) 1 in the most common option;
Solution: 4 out of 15 people enter the store once a week.
b) 8 people did not enter the store this week;
c) Those who entered more than 3 times are 4+2+2+1=9, which is 20% of people.

CONCLUSION

To conclude, we can say that working with such problems in mathematics classes helps students to correctly assess daily life situations and make the right decisions in solving various problems.

REFERENCES:

1. Kolemaev, V. A., Staroverov, O. V., & Turundaevskii, V. B. (1991). Probability theory and mathematical statistics. Vysshaji Shkola, Moscow.
2. Sirojiddinov, S.H., Mamatov, M. (1982). Probability theory and mathematics
3. statistics. Tashkent.
4. Gmurman,V.E. (2001). Probability theory and mathematical statistics, Tashkent.
5. Gmurman, V.E. (2002). A guide to solving problems from the theory of probability and mathematical statistics. Tashkent.
6. Gmurman, V.E. (1972). Probability theory and mathematical statistics. Vysshaji Shkola, Moscow.
7. Pugachev, V.S. (1979). Probability theory and mathematical statistics. Science, Moscow.
8. Kovalenko, I.N., Filippova, A.A. (1973). Probability theory and mathematics
9. statistics. Vysshaji Shkola, Moscow.
10. Xashimov, A.R., Ma'murov, E.N., Adirov, T.X., Probability theory and mathematical statistics.
11. Abdishukurov, A.A. (2010). Probability theory and mathematical statistics. Tashkent.
12. Alijon, A., Xoldorovich, S. Z., & Abbosovna, G. M. kizi, MMA. (2022). Technology of Individualization of Learning. Spanish Journal of Innovation and Integrity, 6, 291-297.
13. Asimov, A. (2019). USING PROBLEMS AND TRAINING STUDENTS TO PROBLEM. Scientific Bulletin of Namangan State University, 1(8), 348-352.
14. Kolmogorov, A. N., & Bharucha-Reid, A. T. (2018). *Foundations of the theory of probability: Second English Edition*. Courier Dover Publications.