Using elements of probability theory in mathematics teacher education in the initial classes

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Анотация:

Развитието на математическия потенциал на учащите се изисква от тях овладяването на знания, получени в уроците по математика в различни математически ситуации. Някои от тези ситуации могат да са свързани с решаването на проблеми или прогнозирането на резултатите от конкретно събитие. Прогнозирането, свързано с решаването на много математически задачи представлява процес на теорията на вероятностите. Това изисква от учащите се да овладеят елементи от тази теория дори на по-елементарно ниво.

Ключови думи: **ситуация, проблемна ситуация, диагностика на умения за решаване на проблеми.**

Аннотация:

Развитие математического потенциала учащихся требует от них применения знаний, полученных на уроках математики, в различных математических ситуациях. Некоторые из этих ситуаций могут быть связаны с решением проблемы или прогнозированием результатов конкретного события. Прогнозирование, связанное с решением многих математических задач, является процессом теории вероятностей. Это требует от студентов овладеть элементами этой теории даже на более элементарном уровне.

Ключевые слова: **вероятность, события, возможное, невозможное, обучение математическим навыкам.**

Abstract:

Developing the mathematical potential of students requires them to apply the knowledge learned in math classes in a variety of mathematical situations. Some of these situations may be related to solving a problem or predicting results from a particular event. Forecasting, which is related to the solving of many mathematical tasks, is a probability theory process. This requires students to master elements of this theory even at a more elementary level.

Keywords: **probability, events, possible, impossible, learning mathematical skills.**

All problems belong to mathematical field called probability. As a mathematical field, probability is very complex. The simplest way to define it is as a measure of possibility that something happens. In mathematics, probability is a measure - a function which assigns non-negative real number, or infinity, to a certain subset of some set.

Probability is a particular measure, a function that maps set of events into a real interval , which means that it assigns a number to the event. To an event which is certain, probability function must assign number one, while for impossible event it must assign number zero. All other events have probability between zero and one. From the teaching point of view, it is demanding and it is not easy to transform it into the form appropriate for kids. But it is still possible and does it makes sense to include probability in lower grades of primary school.

The founders of probability theory are the French mathematicians B. Pascal and P. Fermat. The basic notions of this theory - probability of events and mathematical assumption are introduced by K. Huygens. As a mathematical science, the theory of probability differentiated only after J. Bernoulli proved the private case of the big numbers law.

In the early classes, the use of probability theory is related to experimentation. "The experiment is an experiment model with outputs of end sets. As in each model, it is mainly separated: multiple exits and the possibility of each occurring "[1, p. 346].

Inherently, the probability is the degree of occurrence of an event under certain conditions. The classical probability theory examines the probability as the attitude in which the favorable cases and all the possible cases are. For example, if we cast a dice, there is no reason to believe that one country will turn more often than another. We assume that each of the parties will turn an equal number of times when rolling the dice. This means that when rolling the dice the turn of each side can be expected with a probability equal to 1 in 6 cases, i.e. 1/6. In classical probability theory, the calculated probability of one or another event is confirmed by a check. A situation where symmetrical results of experience are obtained is relatively rare, therefore the concept of relative frequency is used in the educational process when pupils apply the probability theory.

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The relative frequency is the relationship between the number of occurrence of the event being studied in a series of tests under given conditions, and the number of all attempts at which this event may occur under the particular conditions. For example, the following task: In one box there are 3 white, 3 red and 3 black balls. How many balls should be removed from the box without looking to keep one ball of each color?

The relative frequency of this task will show how much try is needed to meet the condition set by the total number of attempts a student can accomplish.

Using probability theory, students can calculate the probability of occurrence of certain events. Take 7 identical balls and place them in a box. Three of the balls are red and the other white. The Probability Theory will help us calculate how many times out of 30 draws we will draw a red ball. Theoretically, we can assume that even in the thirty times we will draw a red ball. We can assume that even with all draws we will draw a white ball. In order to reduce the number of assumptions, with the result being limited to the average results of the students, a conditional formula is offered.

$$\text{Probability of event} = \frac{\text{Number of favorable outcomes}}{\text{Number of all possible exits}}$$

The concept of event we name a result of trial, carried out in a certain set of conditions in which we perform the phenomenon. For example, throwing a coin is a trial, and an event is the country to fall on. The event itself we name credible, impossible and accidental. This event is credible, and it must happen during the trial. For example, if there are only white balls in the box, then the event from the box to take out a white ball is true because there are no balls in the box in the other. If an event cannot happen during the trial, we say it is impossible. It is impossible to remove red from a box of white balls because there is no such a ball placed in the box. It is accidentally called an event that may happen within a trial, but it may not happen. If there are white and red balls in the box, it is accidental to pull out a white ball, because in this attempt we cannot draw a white ball but red.

Several events may occur within one trial. If one event does not rule out the occurrence of the other event, then the two events are called joint. When throwing a coin the events are the same. Incompatible events that cannot happen at the same time. For example, when two dice are thrown, the following two events cannot occur - the same number of dice will fall on both dice and their sum is odd. The sum of two even numbers (even or odd) is always an even number.

When two events occur and there is no reason to suppose that one is more likely to happen than the other, they are called equals. For example, when throwing a dice, the likelihood of falling on each of its six sides is equally possible.

To including the elements of probability theory in the mathematics teaching curriculum of primary school pupils is linked to elementary prediction. Within the lesson, problems related to probability theory can be proposed. Initially, students should be introduced into the world of forecasting. This is done using the probability line. The beam itself is a line that indicates possible predictions characterizing an event (Fig. 1).

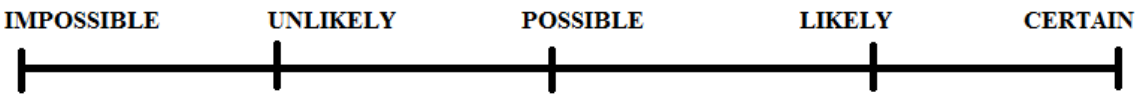


Fig. 1 Probability Line

With the help of the individual sections of the line, students suggest the probability that an event may happen. For example:

Choose one of these words for each event: impossible - unlikely –possible - likely – certain. Give reasons for each of your choices.

When I toss, a coin head will appear.

I shall have pizza for dinner this evening.

It will be sunny day tomorrow.

I will be in school tomorrow.

I shall be in bed by 10:00 pm this evening.

Such exercises are suitable for students in first and second grades because they relate to qualitative forecasting of events (Fig. 2). Measured and calculations are not performed. When the volume of mathematical knowledge of students in grades 1 and 2 is increased, it is appropriate to provide exercises that include numbers, forecasting an event to occur on a quantitative basis (Fig. 3). The quantitative measurement of

the probability of an event happens based on the pupils' knowledge of finding a part of the whole.

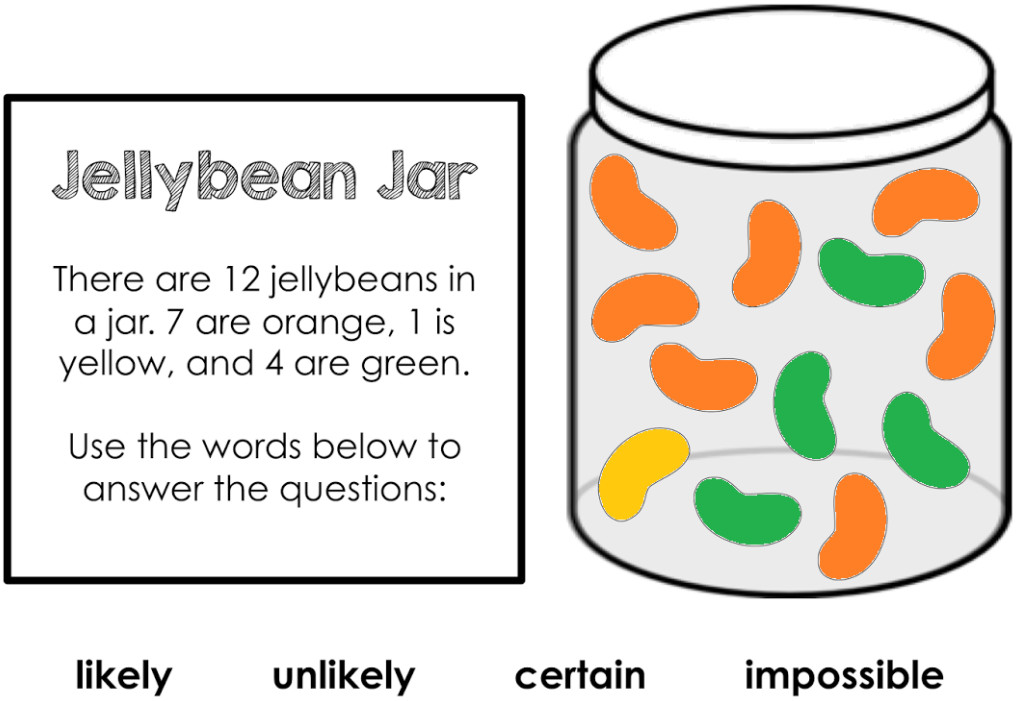
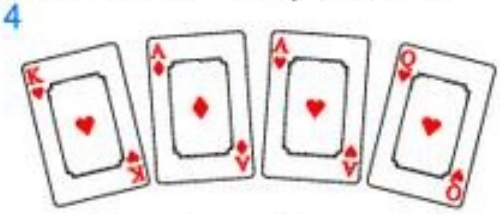


Fig. 2 Exercises for qualitative probability prediction

Look at these cards and answer the questions:
e.g. getting a king 1 in 4



1) What is the chance of getting a picture card, a Queen and an ace?

_____

2) What chance is there of getting a red card?_____

3) What chance is there of getting a king? _____

4) What chance is there of getting an ace ? _____

Look at the spinner below and answer the questions:

5) What is the most likely number you will spin? _____

6) What is the chance of spinning a 1? _____

7) What is the chance of spinning a 4? _____

8) What is the chance of spinning a 3? _____

Fig. 3 Exercises for quantitative probability prediction

Problems associated with probability theory are relatively rare in the learning process of primary school students. Many of these tasks are inaccessible to small students, although elements with a pro-diffuse character are present in extracurricular work.

Mathematical education aims to develop logical thinking and reasoning, to enable pupils to solve math problems and to use their knowledge in real life situations. Contents for teaching mathematics in lower grades of primary schools rare include contents from probability.

Probability is all around us and it seems to be very useful and important to learn probability from early ages. The students in lower grade of primary school are able to understand experiments with notions like possible, impossible and certain, and notions that are more precise: unlikely, even chance, likely, very likely. Those experiences serve them in later education, especially for probability contents and problem solving skills.

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