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THE ROLE OF MATHEMATICAL COMPONENTS IN DEVELOPING PERCEPTION OF SCHOOL STUDENTS

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Abstract: In this article, examples of equations, tables and graphical problems using equations and tables are described, which serve to increase the interest of secondary school students in mathematics, enrich their mathematical talent.

Key words: school, student, perception, mathematics, problem, table, mental ability, mental energy, intellect, mathematical ability, methodology, mathematical thinking.

The methods used in the process of mathematics education and their role in the development of students' mathematical abilities are incomparable. Considerable work is being done in our country today to educate gifted students, develop their abilities and talents. This will allow you to explore new aspects of your abilities. The criteria for the development of mathematical skills were developed in the scientific research conducted by experts from developed foreign countries, and their theoretical and practical aspects were shown.

In the context of the work being done in our country to develop students' abilities, it is possible to show that they have won prizes in prestigious international mathematics Olympiads and reached high levels. Of course, it is necessary not to be satisfied with the achieved results, to develop new principles of development and determination of students' mathematical abilities. There is a lack of special literature on the identification and development of students' mathematical abilities, and therefore, continuous work on their creation is the demand of the times.

Almost all researchers dealing with the problem of ability focus on studying the intellectual abilities of students. Scientists of our country and abroad associate the description of mental abilities with the term "intellect". Sometimes intelligence is used as a synonym for the concept of "mental ability". It is worth noting that the concepts of "intelligence" and "general ability" are not considered the same in the literature published in recent years in Great Britain and the United States.

The concept of "intellect" is considered as an acquired experience, formed on the basis of general ability. We also use the concepts of "intelligence," "ability," and "mental abilities" in our analysis of different approaches to the study of ability. The historical roots of the study of ability are connected with the emergence of the test direction in foreign psychology. It is within this direction that "ability" is considered as a quantitative concept. Test theory recognizes that the abilities of students are qualitatively equal and that it is necessary to create methods for determining quantitative differences in abilities.

The theoretical expression of this type of purely quantitative approach to the problem is reflected in Sh. Spearman's "two-factor intelligence". Accordingly, "mental ability" is determined by the amount of "mental energy". According to S. Spearman, any intellectual activity has a common beginning, and this is called the "common factor of intelligence". In addition to the general factor, a special factor is also included.

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A special factor is specific to a certain type of activity and is valid only in one case. The common factor is intelligence, the content of which is related to individual differences in "mental energy." According to Sh. Spearman, mental energy is characterized by three indicators: amount, level of mental energy; energy level, rate of transition from one activity to another, level of energy fluctuation, and immediate recovery after certain activity.

American psychologist L. Torrens proposed a multifactorial theory of abilities. 12 factors have been identified as primary mental abilities: understanding words, speaking quickly, performing mental operations, the ability to remember and express information, etc. regarded as a set of special abilities that do not exist. An important step was taken in the development of ideas about the nature of talent in the direction of the test. General abilities that provide the ability to determine relationships and connections in the perception of reality are understood as mental abilities.

V.A. Krutetsky studied 9 skill structures designed to develop 5-6 grade students' mathematical abilities. Below we classify the components of development of mathematical abilities of 11-13-year-old students based on the development trends of modern mathematics and based on our scientific-methodical research.

The level of difficulty of the problems presented in the school mathematics textbooks is interrelated. The components of the students' mathematical ability that we offer are as follows:

Development of perception: a) issues related to information search; b) issues related to trial and error methodology; c) issues with incomplete conditions; g) issues with excessive conditions;

a) the issue of searching for information. A 100-cell table is given, which is filled with numbers (a graphic image, various shapes and colorless geometric figures, a set of letters).

4	3	2	8	2	3	6	5	9	1
7	5	7	6	6	5	9	0	8	5
3	1	0	1	3	4	0	6	5	1
7	2	4	1	0	6	2	3	7	1
6	5	4	4	3	8	8	3	1	3
8	0	0	3	2	1	5	4	9	5
0	7	6	3	2	6	3	8	2	9
6	1	7	6	9	5	8	5	9	0
7	4	1	7	5	3	9	2	3	4
6	3	0	7	6	9	1	0	9	1

Count how many times each number from 0 to 9 (graphic image, various shapes and colorless geometric figures, one or another symbol, color) occurs.

Solve: From the given problem, the learner receives information that the number of cells is 100 and each row contains numbers from 0 to 9. So, the fact that there are 10 of them in each row and their location is mixed, so start counting carefully.

0-10, 1-12, 2-8, 3-14, 4-8, 5-11, 6-12, 7-9, 8-7, 9-9 finds that This process encourages learning comprehension. The problem is solved in this way even if the table is marked with a graphic image, geometric figures of various shapes and colors, one or another symbol, color.

b) the issue of trial and error methodology.

*so that the result of the expression is 16 *, what should the # operations be and how should the parentheses be placed?*

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Solve: In this case, the learner uses the method of trial and error correction in various ways by reflecting on these operations and putting parentheses, and by perceiving, he finds the solution of the expression:

$$(14+2)\cdot(4\ \text{-}9:3)=16$$

c) issues with incomplete conditions.

The store has a total of 200 kg of rice, sugar and beans. Rice is 25% more than sugar. How many kilograms of each mentioned product? (Incomplete information about beans)?

Solve: It belongs to the category of issues with incomplete conditions. When solving the problem, the student makes the following reasoning: x kg - rice, y kg - sugar and beans are in excess, because it is stated that rice is 25% more than sugar, but there is no mention of beans, so the student ignores and constructs the following system:

$$\begin{cases} x+y=200, \\ x=1,25y. \end{cases} \Leftrightarrow \begin{cases} 1,25y+y=200, \\ x=1,25y. \end{cases} \Leftrightarrow \begin{cases} 2,25y=200, \\ x=1,25y. \end{cases} \Leftrightarrow \begin{cases} y=\dfrac{200}{2,25}, \\ x=1,25\cdot\dfrac{200}{2,25}. \end{cases} \Leftrightarrow \begin{cases} x=\dfrac{1000}{9}, \\ y=\dfrac{800}{9}. \end{cases}$$

And finally, they will receive the price of 1 kg of rice and 1 kg of sugar. But what happened to some students? they ask the question. If not, the teacher should ask this question. As a result, students look for a solution to the problem, taking into account the beans. They find different solutions. For example: 1) sugar - 20 kg, rice - 25 kg, beans - 155 kg; 2) sugar - 80 kg, rice - 100 kg, beans - 20 kg, etc. In this way, students are convinced that the solution to this problem is not the only one, and that such problems must also be solved. Some students may continue these considerations. It develops students' understanding.

g) issues with excessive conditions.

There are 40 cars and motorcycles in the parking lot. They have a total of 130 wheels and 40 steering wheels. How many of them?

Solve:This is a challenging task where the learner first tries to match 40 cars and motorcycles to their number of wheels and steering wheels. Pupils reason as follows: in a car park there are 20 car wheels and 20 motorcycle wheels, and they find that one wheel is extra. The problem encourages students to formally understand mathematical material. Finally, x is a car and y is a motorcycle

$$\begin{cases} 4x+2y=130, \\ x+y=40. \end{cases} \Leftrightarrow \begin{cases} 4x+2y=130, \\ 4x+4y=160. \end{cases} \Leftrightarrow \begin{cases} 2y=30, \\ x=40-y. \end{cases} \Leftrightarrow \begin{cases} x=25, \\ y=15. \end{cases}$$

he gets the answer: car - 25, motorcycle - 15. From this, students will understand that the information about 40 wheels is more than that, it is also known. Thus, as you can see, the students' ability to perceive develops when the conditions are exceeded.

Determine the location of the telephone, gas station, medical aid point, kitchen, rest area and hotel in the picture and write down the coordinates of the corresponding points (see Figure 1.)

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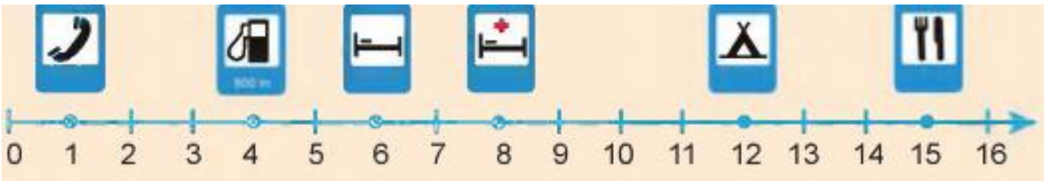

Figure 1 2. How much shorter is the "Cobalt" car in the picture below than the "Lasetti" car? b) how high? (See Figure 2.)

Figure 2

These questions help to develop students' understanding. In the first case, the student imagines places through symbols and develops the perception of measurement by identifying the points located on the number line. In the second problem, perception is developed by finding the difference between cars.

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