METHODS FOR SOLVING LOGICAL PROBLEMS FOR THE DEVELOPMENT OF THE MIND IN MATHEMATICS

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ANNOTATION

Whatever the type of learning activity, it is the "tasks" that engage the student and encourage him to think. The ability to recall and apply new knowledge in various learning processes, to generalize and assimilate the acquired knowledge is directly related to learning tasks, and tasks are a means of developing the student's knowledge (these ideas are not copied from anywhere). I came to this conclusion by observing students when I was in schools for experimental testing and work with teachers. Indeed, in order to gain new knowledge, the student uses his previous knowledge, applies and reinforces the acquired knowledge with examples and tasks.

Key Words. *non-standard tasks, comparison tasks, logical tasks, complex tasks.*

Educational tasks differ (non-standard tasks, comparison tasks, logical tasks, complex tasks), the logical tasks included in them are designed to form the student's thinking and play a very important role in the development of the student's thinking abilities. None of the tasks can compete with logical tasks in the development of mental activity of students, the formation of thinking.

The peculiarity of the logical exercises described below is that they do not require great mathematical abilities for their implementation. These exercises are mostly entertaining, they instantly attract those who do not like mathematics. Solving logical problems develops mathematical thinking, not only arouses a genuine interest in mathematics, but also leads to its thorough understanding, assimilation, which contributes to the successful assimilation of not only mathematics, but also other academic subjects.

Some of them are able to solve logical problems, but they cannot explain in what form, in what ways they did it. To prevent such problems, it is necessary to teach elementary school students to solve logical problems, to be able to draw the right conclusions from the knowledge and results obtained, in order to clearly understand the solution of a logical problem.

In our daily life, when communicating with people around us, we encounter such phenomena or problems when this situation serves as an impetus for resolving these surprises, encourages a person to create innovations. While enjoying some kind of drawing, some kind of game, entertaining exercises come to mind based on mathematical thinking. In the course of our scientific research, we called such tasks that arouse the desire for creativity in students “Issues of the disclosure of creative abilities” and settled on the following aspects. There are very few such tasks and they arise when interacting with tasks from other subjects and disciplines or being inspired by scientific research and discoveries in other areas of science.

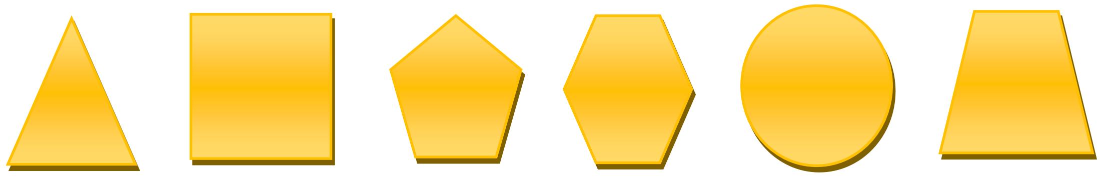
Task 1. Consider the picture (Fig. 1).

Fig.1. Masha and the Bear.

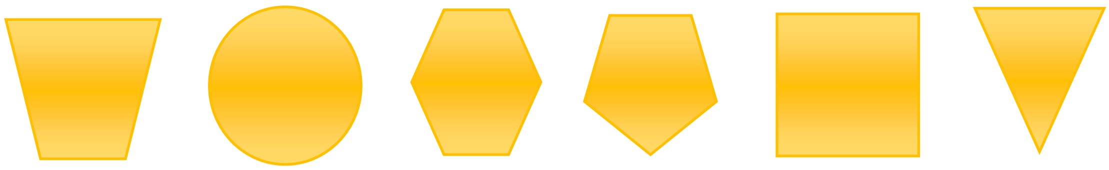
Students answer the question: “What animal is shown in the picture?” By analyzing the illustration, they learn to be attentive and observant.

Now we ask the students to look at the pictures from the back (The teacher turns 180 degrees) Naturally, the students will again see "Masha and the Bear", depicted in the previous picture. They begin to examine the picture, turning it over. With the help of appropriate examples, we show students that this kind of uniformity can be observed in mathematical figures.

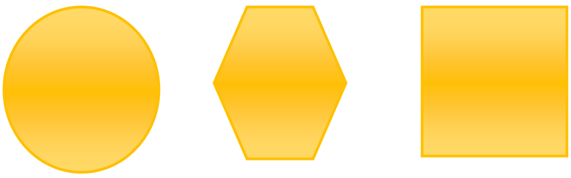
Task 2. Draw these geometric shapes in a notebook.



Looking at the figures in reverse order (turning the tetrad 180 degrees), again find the figures that were formed in exactly the same way.



From the geometric shapes, the same shapes are selected (circle, hexagon, square).



From the selected figures, the teacher suggests making combinations of 2, 3 and 4 figures, observing the following conditions:

• in a combination of two figures they must be the same:

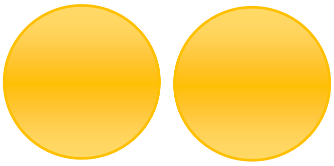
• in a combination of three figures, the first and third are the same, the second is arbitrary, different from them;

• in a combination of four figures, then the 1st and 4th figures are the same, and the 2nd and 3rd figures are similar;

• in a combination of five figures, then the 1st and 5th figures are the same, and the 2nd and 4th figures are similar and the 3rd is arbitrary.

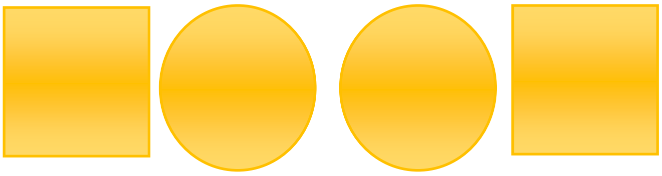
Let us give examples of the described combinations of figures.

a)



b)

c)



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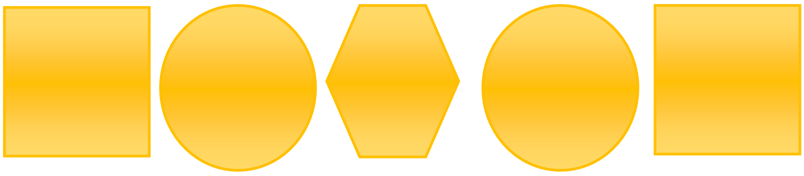

The reason why we chose the geometric shapes above is that it will be easy and interesting for an elementary school student to understand the problem developed with visual aids. It will be easier for the student to work with numbers and figures in the following tasks.

Logical tasks are a good help for the development of the mind. We gradually transfer students from the world of pictures to the world of numbers, and then to the world of numbers. After elementary school students are introduced to the world of numbers, the above aspects with figures, by writing them with numbers, can be shown as follows:

Task 3. Write all the numbers in a notebook.

0 1 2 3 4 5 6 7 8 9

Flip ‘em up.

6 8 ㄥ 9 ϛ ㄣ Ɛ ᄅ Ɩ 0

What numbers can be read? (0, 6, 8, 9.)

Which numbers have not changed after the rotation? (0 and 8.)

The teacher draws attention to the fact that the rest of the number 6 after the turn became the number 9, and vice versa.

Students can complete the following task after getting acquainted with two-digit numbers.

Task 4. Write two-digit numbers that can be read after turning. For two-digit numbers, use only the numbers 0, 6, 8, and 9.

Students write down the numbers 60, 66, 68, 69, 80, 86, 88, 89, 90, 96, 98 and 99.

They then show how the numbers will look after the rotation:

60→09, 80→08, 90→06;

66→99, 86→98, 96→96;

68→89, 88→88, 98→86;

69→69, 89→68, 99→66.

Among them, if we look at the opposite, they form again 69, 88, 96. Students may think that the numbers 66, 86, 68, 98, 89, 99, if they are turned over, will again appear in their previous form, but during the task they are convinced of the error of this hypothesis. Arguing similarly, younger students can find self-generated three-digit, four-digit, etc. numbers.

Task 5. Write 3-digit and 4-digit numbers that will be obtained in reverse order (use problems 3 and 4).

To complete the task among the digits of self-formed two-digit numbers, younger students write down 0 and 8:

69→ 609, 689.

88→ 808, **888**.

96→ 906, 986.

From each of the given 3 numbers (69, 88, 96), with the help of 2 digits, we form 2 more numbers and 6 three-digit numbers formed when viewed from the back.

To find similar four-digit numbers, students write 00, 69, 88, 96 among the digits of two-digit numbers:

69→ 6009, 6699, 6889, 9966.

88→ 8008, 8698, 8888, 8968.

96→ 9006, 9696, 9886, 9966.

We found among the four-digit numbers the numbers that are formed again when they are considered from the reverse side. From each 3 and 2-digit number (69, 88, 96) they formed 4 and determined that their number is 12.

In order to find self-generated nine-digit numbers between the fourth and fifth digits of a self-generated eight-digit number, you need to write 0 and 8.

To find an eight digit number, we first find a six digit number. To find a six-digit number, use the 2nd and 3rd digits of a four-digit number (6009, 6699, 6889, 9966, 8008, 8698, 8888, 8968, 9006, 9696). , 9886, 9966). Between them we write the numbers 00, 69, 88 and 96:600009, 606909, 608809, 609609, 660099, 666999, 668899, 669699, 680089, 686989, 688889, 689689, 990066, 996966, 998866, 999666, 800008, 806908, 808808, 809608, 860098, 866998, 868898, 869698, 880088, 886988, 888888, 889688, 890068, 896968, 898868, 899668, 900006, 906906, 908806, 909606, 960096, 966996, 968896, 969696, 980086, 986986, 988886, 989686, 990066, 996966, 998866, 999666.

We create an eight-digit number by writing the numbers 00, 69, 88, and 96 between cells 3 and 4 of the resulting 48 six-digit numbers. In this case, we create 4 more numbers from each six-digit number:

600009→ 60000009, 60069009, 60088009, 60096009;

606909→ 60600909, 60669909, 60688909, 60696909;

608809→ 60800809, 60869809, 60888809, 60896809;

609609→ 60900609, 60969609, 60988609, 60996609;

....

999666→ 99900666, 99969666, 99988666, 99996666.

Eight digit numbers are 192 and we use them to write nine digit numbers (384):

60000009→ 600000009, 600080009;

60069009→ 600609009, 600689009;

60088009→ 600808009, 600888009;

60096009→ 600906009, 600986009;

....

99996666→ 999906666, 999986666.

And to find a ten-digit (768) number, the numbers 00, 69, 88 and 96.

60000009→ 6000000009, 6000690009, 6000880009, 6000960009;

60069009→ 6006009009, 6006699009, 6006889009, 6006969009;

60088009→ 6008008009, 6008698009, 6008888009, 6008968009;

60096009→ 6009006009, 6009696009, 6009886009, 6009966009;

....

99996666→ 9999006666, 9999696666, 9999886666, 9999966666.

Summarizing the above, we note that in order to detect self-generated numbers when they are considered from the reverse side among 2n-digit numbers among the digits n -1 and n 2n-2-digit. numbers, the digits 00, 69, 88 and 96 are entered. And to determine among the 2n + 1-digit numbers among the digits of n - and n + 1 2n-digit numbers, the digits 0 and 8 are entered.

Knowing the patterns of construction of self-generated numbers, you can determine their number. The students found out that among the single-digit numbers there are 2 self-forming, among the two-digit - 3, among the three-digit - 6, among the four-digit - 12, among the five-digit - 24, ... We write these numbers in order:

2, 3, 6, 12, 24, 48, …

This sequence can be written as follows:

2, 3×1, 3×2, 3×4, 3×8, 3×16,… .

Among n-digit numbers, the number of numbers newly formed when they are observed from the reverse side of the numbers is $3\times2^{n-2}$ ($n\geq2$).

If you teach students to see non-standard moments in interesting tasks already in elementary school, then they will grow up as individuals with a high level of thinking..

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