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TEACHING PUPILS TO SOLVE INGEUNITIVE MATHEMATICAL TASKS

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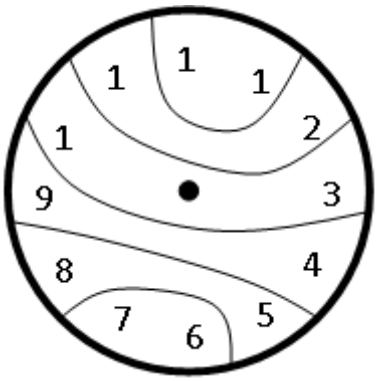
ABSTRACT
Ingenuity learning tasks are an essential tool in the formation of pupils' independent thinking. By teaching pupils to solve creative tasks, they enhance logical thinking and creative activity. Their interest in mathematics will grow. They enjoy their work by completing homework assignments independently. This article covers intriguing square problems in the form of similar assignments 3x3, 4x4, 5x5.

KEYWORDS: *ingenuity, independent thinking, logical thinking, creative activity, interesting square, interesting triangle.*

I. INTRODUCTION

Teaching students to think independently is one of the most important tasks for any primary school teacher. Reforms to bring the educational process to a new level of quality in the country and development of material and technical base have developed a normative framework for the enhancement of spiritual and moral qualities based on national and universal values, the need for students to acquire knowledge from primary education. "The Strategy of Actions" for the further development of the Republic of Uzbekistan prioritizes the issue of "educating physically healthy, mentally and intellectually developed, independent-minded, loyal to the Motherland, deep-rooted democratic reforms and increasing their social activity in the development of civil society."



Inguinity tasks are of overriding importance in terms of formulating pupils' logical thinking. It is gratifying to see the inclusion of ingenuity assignments in math textbooks published in recent years. In particular, in the 3rd grade mathematics textbook published in 2012 (Authors S.Burhanov, O.Khudoyorov, K.Norkulova), it is planned to consider such assignments in the form of puzzles for gifted students in almost each and every lesson. In practice, an overwhelming majority of students are

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less enthusiastic about completing such assignments; as such mathematic puzzles require in-depth observation and the application of theoretical knowledge.

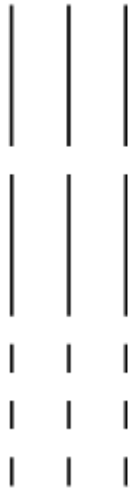
II. ANALYSIS

We describe below the methodology for performing some of these tasks.

Assignment 1. Divide the surface of the clock into 6 parts so that the sum of the numbers in each part must be the same.

This task requires the student to think logically. Numbers from 1 to 12 should be divided into 6 groups so that the sum of the numbers in each section should be equal to each other. It is crystal-clear that it is possible to determine the sum of numbers from 1 to 12, 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 = 78. 78 divided by 6, we get 78: 6 = 13. So these options are 12 + 1 = 11 + 2 = 10 + 3 = 9 + 4 = 8 + 5 = 7 + 6

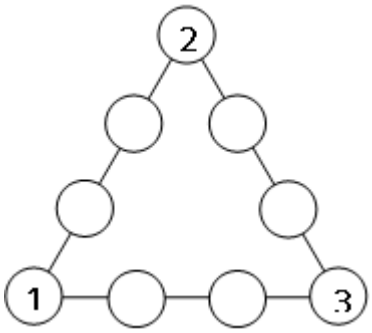
Assignment 2. If 3 out of 9 sticks are divided into 3 pieces each, what is the total number of sticks?



This task involves finding the total number of objects when any 3 of the 9 objects consist of 3 parts each. It is advisable to present it as an exhibition as follows. Its solution may vary.

1 - method $3 \cdot 3 + 3 + 3 = 15$
2 - method $3 \cdot 5 = 15$
3 - method $3 \cdot 3 + 3 \cdot 2 = 15$

Assignment 3. Place 6 numbers from 4 to 9 in empty circles so that the sum of each row is 17.



In this creative task, you have to choose 6 numbers so that the sum of the results is 17 in a row.The teacher can prepare the assignment on separate sheets and assign it to the pupils (pairs) sitting at each desk as group work - independent work.

Students will be interested in this task. Students will find a variety of solutions.

Properly solved options will be referred to the student discussion.

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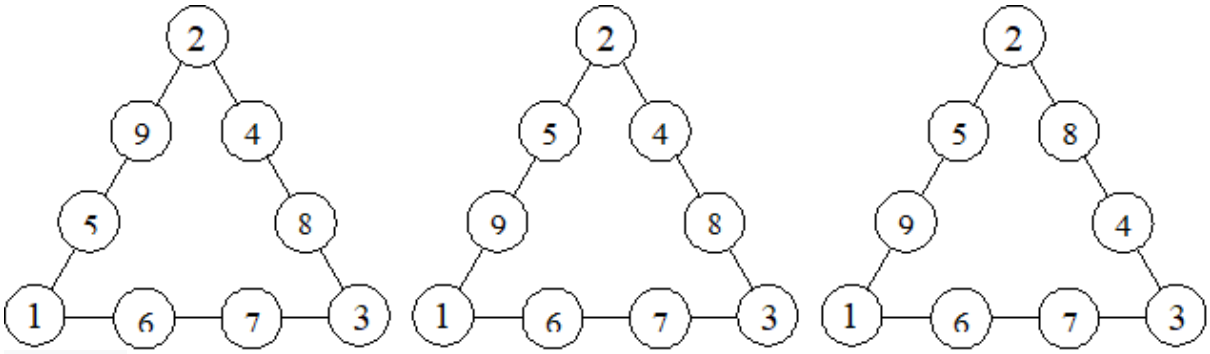
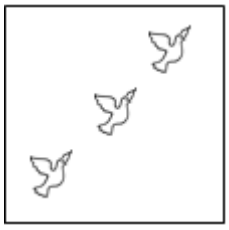


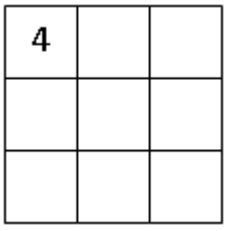
Given the number of sorted sets made up of 2 out of 6 elements, there will be 15 different solution options for the above task. The most memorable of these options is Figure 3, where the numbers 1, 2, and 3 at the ends of the triangle are followed by the corresponding numbers 9, 8, and 7, which complement them by 10. As a result, there is 1 empty circle on the sides of the triangle. To find them, subtract the sum of the numbers in the row from 17. These numbers are 5.6, 7, respectively. This task is called "Interesting Triangle". Teaching pupils to complete tasks such as "Interesting Triangle" and "Interesting Square" will increase their ingenuity and develop their logical thinking. In particular, the creation of such assignments by pupils independently requires creativity and independent thinking

Assignment 4. A flock of birds is flying, one bird in front, two birds behind it; one bird in the back, two birds in front of him; one bird in the middle, one bird in front of him, one bird is behind him. How many birds are there in the flock?



This logical question requires the student to think logically. Some students look at a logical problem as an arithmetic operation on a given number, divide the problem into three parts, solve the problems for each part, and answer that there are a total of 9 birds. In this regard, the following considerations can be made: Since there is one bird in front and two birds behind it, in the first part of the problem it is considered as 1 + 2 = 3 birds. Similarly, in the part of the problem where one bird in the back is two birds in front of it, the answer is 1 + 2 = 3 birds. For the third part, the answer is 1 + 1 + 1 = 3 birds. So they find a general answer to the problem as 3 + 3 + 3 = 9 birds.However, since the problem is logical, it is conducive to provide the following diagram, which describes the condition of the problem. As can be seen from the diagram, the solution to the condition given in the text of the given problem is a flock of three birds.

Assignment 5. Arrange the numbers 1 through 9 in square squares so that the sum of the numbers on each row and column of the square is 15.



This "interesting squares" task requires the student to think independently. The number 4 is given in one of the squares in this assignment given in the textbook. The student must place the remaining 8 numbers so that the sum of the numbers on the rows, columns, and even diagonals is 15. It can be seen that students have found solutions to different options. These options are created by rotating the square by 5, or by rotating the horizontal and vertical columns.

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4	3	8
9	5	1
2	7	6

When placing numbers from 1 to 9 in a 3x3 square, the solution to this problem, which is the sum of 15 columns, rows, and diagonals, is as follows: first write the number 5 in the middle of the square, then In the corner cells of the square, the sum of the diagonals 15 is written so that the even numbers 4, 8, 6, 2 are written in such a way that 4 and 6, and 8 and 2 are on the same diagonal. Then the numbers 1, 3, 7, 9 are placed so that 4 and 6, and 8 and 2 be on the same diagonal. Then the numbers 1, 3, 7, 9 are placed so that the sum of the columns and rows is 15. Here's another way to fill in this "Interesting Square". Let's write the numbers from 1 to 9 in order, tag to tag. Draw a line parallel to each other by tilting a sheet of paper (turning it left and right at the bottom). The lines drawn are 3x3 squares.

The numbers 2, 4, 5, 6, 8 in the same square remain in the square, we place the numbers 9, 1, 7, 3 outside the square in such a way that the resulting square is the number of columns, rows and diagonals. To do this, move the number 9 to an empty cell between 2 and 4, and 1 to an empty cell between 6 and 8. Similarly, the number 3 moves to the empty cell between the numbers 4 and 8, and the number 7 moves to the empty cell between the numbers 2 and 6. The result is an "interesting square".

Grade 4 students can be encouraged to find a “4x4” “Interesting Square”. Numbers 1 to 16 should be placed in squares of 4 squares with sides so that when you add the numbers along the row, column, and diagonal, the result is the same 34. This task is a very difficult task and requires creative activity from the student. We found it necessary to give a method of deriving one of the solution options.

1	14	15	4
12	7	6	9
8	11	10	5
13	2	3	16

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

The first step is to write the numbers from 1 to 16 in the "4x4" squares. The second step is to alternate the numbers 5 in row 2 and 12 in row 3. The number 8 in row 2 is replaced by the number 9 in row 3. In the third step, the numbers 2 and 3 in row 1 are replaced by the numbers 14 and 15 in row 4, respectively. In the fourth step, the numbers 6 and 10 in column 2 are replaced by the numbers 7 and 11 in column 3, respectively, to form an “interesting square”.

	2	3	
5			8
9			12
	14	15	

16			13
	11	10	
	7	6	
4			1

16	2	3	13
5	11	10	8
9	7	6	12
4	14	15	1

A more interesting and memorable version of creating a 4-order “Fun Square” for the reader is also found in the math literature. We prepare two 16-cell 4-order squares.

Let's draw diagonals of square 1. From the numbers 1 to 16, we write the numbers corresponding to the empty cells that do not intersect diagonally, these numbers are 2, 3, 5, 8, 9, 12, 14, 15.

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In square 2, we write the numbers that are not written in descending order from 16 in the cells where the diagonals intersect. These numbers are 16, 13, 11, 10, 7, 6, 4, 1.

Now let's put these two squares on top of each other and fill in the numbers in the cells. A "wonderful square" is created.

This "Interesting Square" is also called the "Wonderful Square". This is due to the fact that it has its own characteristics.

Firstly, the sum of the numbers on the columns, rows, and diagonals is 34.

Secondly, the sum of the 2x2 squares in the four corners of the square and the 2x2 squares in the center of the square is 34.

These squares are:

1	14
12	7

15	4
6	9

8	11
13	2

10	5
3	16

7	6
11	10

Thirdly, the sum of two adjacent numbers in a row is 15 or 19. These alternate in rows. Fourthly, the sum of the numbers 12, 14, 5, and 3 in the square is equal to the sum of the numbers 15, 9, 8, and 2 in the square. When the numbers in this square are connected by lines, two equilateral rectangles are formed. The sum of the numbers at its ends is equal to 34:

12 + 14 + 5 + 3 = 15 + 9 + 8 + 2 = 34

Fifthly, when the rows and columns in a square are replaced by the first and fourth, and the second and third rows or columns, respectively, the “Wonderful Square” property is retained. Only the sum of the numbers on the diagonal may not be 34.

Here are four "Wonderful Squares" of order. Gifted elementary school students can be encouraged to create an interesting 5x5 square of the fifth order.

1	15	10	8
14	4	5	11
7	9	16	2
12	6	3	13

1	15	6	12
14	4	9	7
11	5	16	2
8	10	3	13

1	15	4	14
12	4	9	7
13	3	16	2
8	10	5	11

Task. Place the numbers 1 to 25 in a square of order 5 so that the sum of the numbers on the columns, rows, and diagonals is equal. This task is more difficult, but it will be easier to do it by quickly learning how to create an "interesting square". It's like doing a 3x3 "Interesting Square". Numbers from 1 to 25 are written in five orders. The sheet of paper is divided into squares using diagonal lines. The lines drawn are 5x5 squares.

The numbers 11, 7, 3, 12, 8, 17, 13, 9, 18, 14, 23, 19, 15 located in the same square remain in the square. A number outside the square is written in the empty cell between the numbers 13 and 19 in column 3, and the number 25 is written in the empty cell between the numbers 7 and 13 in the same column. The number five is written in the empty cell between the numbers 17 and 13 in line 3, and the number 21 is written in the empty cell between the numbers 13 and 9 in the same line. The numbers 6 and 2 and 24 and 20, respectively, are written in empty cells that are not adjacent to the column in which these numbers are located. Numbers 4 and 10 and 16 and 22 are placed according to the same rule.

III. CONCLUSION

By teaching pupils to tackle mathematical creative tasks, they develop logical thinking and creative activity. This, definitely, kindles their interest toward mathematics. They will be mesmerized by completing homework assignments independently.

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