MATHEMATICS WITHOUT BORDERS

AGE GROUP 2

SPRING 2019

INSTRUCTIONS

1. Please **DO NOT OPEN** the contest papers until the Exams Officer has given permission.

2. There are 20 questions with an open answer in the test.

3. Please write your answers in the ANSWER SHEET.

4. Each correctly solved problem earns 2 points, a partial solution earns 1 point, and unanswered or wrong answer gets 0 points.

5. The use of calculators or other electronic devices, as well as books containing formulae is NOT allowed during the course of the contest.

6. Working time: not more than 60 minutes. In the case of an equal number of solved problems, the higher ranked participant will be the one who has spent less time solving the problems.

7. No contest papers and draft notes can be taken out by any contestant.

8. Students are NOT allowed to receive help by the Exams Officer or by anyone else during the contest.

WE WISH YOU ALL SUCCESS!

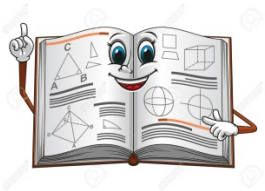
Problem 1. Find □, if

$$3 + 3 + 3 + 3 + 3 + 3 + 6 = \square \times 6.$$

Problem 2. In how many ways can we write the number 10 as the sum of equal numbers?

Problem 3. How many two-digit numbers are smaller than the number equal to $6 \times 7 - 3$?

Problem 4. A book has 100 pages. The pages of the book have been numbered, starting with the number 1 on the first right page and number 2 on the next left page. The following pages are numbered 3, 4, 5 etc.



How many times will the product of both pages of each sheet be a two-digit number?

Problem 5. What number is behind the square □?

$$\square \times 7 + 4 - \square = 34$$

Problem 6. Some boys and girls are playing in a playground. There are 18 girls. There are 3 times less boys than girls.How many children are playing in total?

Problem 7. I have 8 coins that weigh 42 grams in total. 7 of them are identical and the remaining one is heavier. I chose 6 coins and weighed them. It turned out that they weigh 30 grams in total. How many grams does the heavier coin weigh?

Problem 8. Ivan came up with the following puzzle: ** - 5 = *.

(the difference of a two-digit number and 5 is a one-digit number)

Peter replaced the star symbols with digits and got the following correct equation:

$$10 - 5 = 5.$$

How many other such replacements are possible?

Problem 9. Each of the children in a family has at least 1 brother and at least 2 sisters. At least how many children are there in this family?

Problem 10. Ivan started writing down the following numbers:

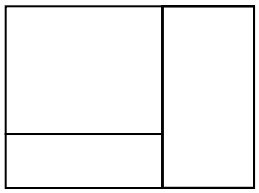
1 one-digit number, 2 two-digit numbers, 3 three-digit numbers, followed by another one-digit number, 2 more two-digit numbers and 3 more three-digit numbers, etc. How many three-digit numbers did Ivan write, if he wrote 47 numbers in total?

Задача 11. Let us throw 3 dice, each of which has between 1 and 6 dots. Let us then calculate the sum of the number of dots that the dice fell on. (On the picture below you can see that the sum is 5 + 6 + 6 = 17.) How many numbers from 1 to 20 are NOT possible?

Problem 12. There are as many even numbers from 3 to 11 as there are odd numbers from 14 to the even number X. Find the number X.

Problem 13. Four different points *A*, *B*, *C* and *D* lie on a straight line. There are 3 line segments with two of the points *A*, *B* and *C* as their endpoints *(AB, BC* and *AC)*. How many line segments are there with two of the four points as their endpoints?

Problem 14. The figure on the diagram below is made up of 3 rectangles. We must color them in 3 colors. Two neighboring rectangles cannot have the same color. In how many ways can we do this?



Problem 15. Calculate the sum of all two-digit numbers with 6 as the product of their digits.

Problem 16. Which number should we replace "?" with, in order for the following equation to be true?

$$\underbrace{2+2+\cdots+2}_{10\ \ 2s} = 2 + \underbrace{3+3+\cdots+3}_{?\ \ 3s}.$$

Problem 17. At least how many digits should we remove from the expression $7 \times 8 \times 9 \times 10$ in order to get the smallest possible product?

Problem 18. Calculate the difference of the sums of all odd one-digit numbers and all even one-digit numbers.

Problem 19. Three friends: Peter, Michael, and Jack, were born in Tashkent, Astana, and Abuja. Peter was born in Abuja. Jack was not born in Tashkent. Which boy was born in Tashkent?

Problem 20. Which sum, smaller than 10 cents, cannot be paid using 4 coins of 1 cent and two coins of 2 cents?