MATHEMATICS WITHOUT BORDERS

AGE GROUP 4

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. Calculate

72 hundreds + 12 tens - 38 ones.

Problem 2. Find the thousands digit of the number equal to

$$28 \times 100 + 56 \times 200 + 78 \times 500.$$

Problem 3. Alec wrote down the numbers 1, 3, 5, 7, ... , 45, 47, 49, and Peter wrote down the numbers 4, 6, 8, ... , 34, 36, 38. How many numbers in total did both of them write?

Problem 4. A magician placed a flower in a vase. One second later the flowers were 2. Every second the number of flowers in the vase doubled. In 23 seconds, the flowers were 16 777 216. How many seconds would it take for there to be 8 388 608 flowers?

Problem 5. Replace the question mark in the following expression with a number, so that the equation would be correct. Find the number.

$$3 \times 2019 = ? + 2016 + 2017 + 2018$$

Problem 6. How many minutes should we subtract from 3 hours in order to get 360 seconds?

Problem 7. Ivan came up with the following puzzle: *** - 5 = **.

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

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

$$100 - 5 = 95.$$

How many other such replacements are possible?

Problem 8. I wrote down 4 numbers, then erased one of them. The remaining numbers are 9, 99, 99. If the sums of each two of the four numbers are equal to three different numbers, find the sum of the four numbers.

Задача 9. I have 8 coins that weigh 84 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 54 grams in total. How many grams does the heavier coin weigh?

Problem 10. It takes me 1 hour and 30 minutes to travel 144 km with my car. How many km will I travel in 6 hours if I travel at the same speed?

Problem 11. A square has a perimeter of 2 dm. Find the area of the square in mm^2.

Problem 12. Find the area of a rectangle in cm^2 if one of its sides is 5 cm and the difference between the length and the width is 1 cm.

Problem 13. Five different points lie on a straight line. How many line segments have these points as their endpoints?

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Problem 14. The point 1 lies on a straight line. The point 2 lies to the right of point 1. The point 3 lies to the right of point 2. The distance from point 1 to point 2 is equal to the distance from point 2 to point 3, etc. Finally, the point 101 lies to the right of point 100, and the distance from point 100 to point 101 is equal to the distance from point 99 to point 100. If the distance from point 1 to point 101 is 1 metre, how many cm is the distance from point 13 to point 31?

● 1 ● 2 ● 3 ● 4 ● 5 …… ● 101

Problem 15. 40 sticks of identical length are necessary to build a 4×4 square grid. How many such sticks would be necessary to build a 6×6 square grid?

Problem 16. In how many ways can we distribute some sweets between four children (Ivan, Peter, Krasi and Nicky), if the following 5 conditions are fulfilled?

- Ivan and Peter have 5 sweets in total;
- Peter and Krasi have 6 sweets in total;
- Krasi and Nicky have 5 sweets in total;
- Nicky and Ivan have 4 sweets in total;
- Each child got at least 1 sweet

Problem 17. The numbers from 7 to 20 were written down in order. The result is the multi-digit number 78910111213141516171819 20. Then 22 of the digits were removed in order to get the greatest possible number. Find this number.

Problem 18. In how many ways can we remove the least digits in order for the product of $1101 \times 1102 \times ... \times 1109 \times 1110$ to be the least possible?
(the order of removing digits is not important)

Problem 19. A math test consists of 10 problems. For each correct answer you get 2 points. For each wrong answer you lose 1 point. For each missing answer you get 0 points. At the beginning of the test everyone automatically gets 11 points, to which their result is added. At least how many students should take the test in order for at least two of them to end up with the same number of points?

Problem 20. Three boxes contain one ball each: white, green or black. The first box is labeled “white”; the second box is labeled “black”, and the third box is labeled “white or green”. None of the labels match the color of the ball in the box. Which box contains the white ball?