



## MATHEMATICS WITHOUT BORDERS

AGE GROUP 5

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 the smallest number, greater than 1, which has 5 hundredths and 6 hundredths?

**Problem 2.** Calculate

$$17\frac{4}{17} - 2\frac{4}{35} + 2\frac{13}{17} - 2\frac{1}{35}.$$

**Problem 3.** Instead of increasing a number by 0.1, I decreased it 10 times and got 20.19 as a result. What number was I initially supposed to get?

**Problem 4.** Three different digits:  $a$ ,  $b$  and  $c$ , were used to create the two-digit number  $\overline{bb}$  and the three-digit number  $\overline{abc}$ .

If  $\overline{bb} + \overline{bb} = \overline{abc}$ , calculate  $a + b + c$ .

**Problem 5.** A container contains 21 litres of water, and another container contains 4 litres of water. The same amount of water was added to each of the two containers. Now there is three times more water in the first container than there is in the second. How many litres were added to each of the containers?

**Problem 6.** 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 7.** Ivan wrote down all natural numbers smaller than 1000 that have 144 as the product of their digits. Then he divided the smallest number by 100. Find the remainder.

**Problem 8.** Alec, Boris and their friends shared a total of 30 bananas, 36 oranges and 42 lemons. Each of them got the same number of fruits of each kind. How many friends did Alec and Boris share with?

**Problem 9.** The number  $A$  has 2019 digits and is divisible by 9. Let  $B$  be the sum of the digits of  $A$ , and let  $C$  be the sum of the digits of  $B$ . How many possible values of  $C$  are there?

**Problem 10.** A few teams are competing in an athletics tournament. Each team has 9 boys and a third as many girls. How many teams are there, if there are 144 contestants in the tournament?

**Problem 11.** 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 12.** Express the number 13 as the sum of a few natural numbers with the greatest product possible. How many numbers were added?

**Задача 13.** Four children are sharing some sweets. The following 5 facts are true:

- 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.

How many sweets did Nicky get?

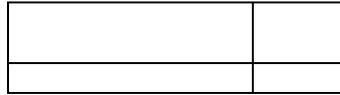
**Problem 14.** At least how many digits should we remove in order to get the smallest possible product?

$$\frac{1}{101} \times \frac{2}{101} \times \dots \times \frac{9}{101} \times \frac{10}{101}$$

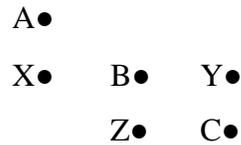
**Problem 15.** There are 2 five-digit numbers  $42*4*$ , that are divisible by 72. Add them and calculate the result.

**Problem 16.** 40 sticks of identical length are necessary to build a  $4 \times 4$  square grid. How many such sticks would be necessary to build a  $10 \times 10$  square grid?

**Problem 17.** A rectangle has been divided into four smaller rectangles with areas of 1, 2, 6 and  $X$ . Find the smallest possible value of  $X$ .



**Problem 18.** How many triangles can you find that have all vertices on the following points?



(The points  $A$ ,  $B$  and  $C$  lie on a straight line; the points  $X$ ,  $B$  and  $Y$  also lie on a straight line.)

**Problem 19.** A cube with an edge of 25 cm has been divided into smaller identical cubes, each with an edge of 5 cm. How many faces in total do the small cubes have?

**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?