MATHEMATICS WITHOUT BORDERS

AGE GROUP 5

SPRING 2020

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

$$0.2 - 0.1 + 0.3 - 0.2 + 0.4 - 0.3 + \cdots + 2 - 1.9 + 2.1 - 2.$$

Problem 2. Find the smallest number, greater than 1, which has 3 hundredths and 4 hundreds?

Problem 3. Calculate

$$2019 \times 20202020 - 2020 \times 20192019$$

Problem 4. Calculate *x*, if

$$x\ mm^2 + 100\ cm^2 = \ 0,1m^2.$$

Problem 5. Calculate

$$12\frac{7}{12} + 2\frac{23}{24} - 2\frac{5}{12} - 2\frac{3}{24}.$$

Problem 6. Remove some of the digits of the number 512 021 064 in order to get the greatest possible number that is divisible by 9.

Problem 7. Find all 5-digit numbers 35*3* which are divisible by 28.

Problem 8. When dividing two natural numbers we get 5 as a quotient and 6 as a remainder. Calculate the smallest possible sum of these numbers.

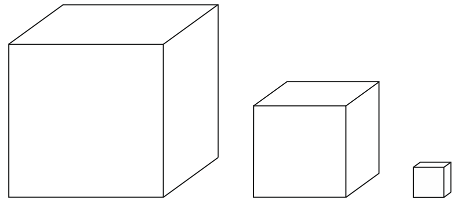
Problem 9. A container contains 24 litres of water, and another container contains 4 litres of water. The same amount of water was added to each of the two containers. Now there is three times more water in the first container than there is in the second. How many litres were added to each of the containers?

Problem 10. If x and y are different digits, such that

$$\frac{\overline{xy}}{y} = \overline{1x},$$

find all possible values of $x + y$.

Problem 11. Three cubes with edges 5 cm, 3 cm and 1 cm are attached to one another. Find the least possible value of the surface area of the new figure.



Problem 12. 40 sticks of identical length are necessary to build a 4×4 square grid. How many such sticks would be necessary to build a 8×8 square grid?

Problem 13. A rectangle has been divided into four smaller rectangles with areas of 1, 2, 5 and X. Find the smallest possible value of X.

Problem 14. There are three isosceles triangles with lengths expressed in integer centimeters and a perimeter of 11 cm. Find the smallest side length of these triangles in centimeters.
(Hint: The sum of any two side lengths of a triangle is always greater than the length of the third side.)

Problem 15. The speed of a boat going downstream is 16 *km/h*, and the speed of the same boat going upstream is 10 *km/h*. What is the speed of the boat in still waters?

Problem 16. How many of the numbers $1.\overline{5}$, $1.\overline{6}$ and $1.\overline{7}$ are greater than the number equal to

$$0.\overline{3} + 0.\overline{6} \times 2?$$

Problem 17. The greatest among 4 natural numbers A, B, C and D is A: $A > B,\ A > C,\ A > D$. If $A + D = 20$ and $B + C = 35$, find the number D.

Problem 18. At least how many digits should we remove in order to get the smallest possible product?

$$\frac{1}{13} \times \frac{2}{13} \times \dots \times \frac{11}{13} \times \frac{12}{13}.$$

Problem 19. Instead of increasing a number by 0.1, I decreased it 10 times and got 20.21 as a result. What number was I initially supposed to get?

Problem 20. We are given several three-digit numbers. If we only remove the first digit of each of those numbers, we would get a perfect square. If we only remove the last digit of each of those numbers, we would get a prime. How many such three-digit numbers are there?