MATHEMATICS WITHOUT BORDERS
AGE GROUP 4
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
$$111 \times 108 \;+\; 111 \times 96 - 111 \times 204.$$

Problem 2. What digit should we replace * with?
$$9 * 1 + * 93 + 36 * = 2020$$

Problem 3. Calculate
$$2020 \div 101 + 3030 \div 101 - 5050 \div 505.$$

Problem 4. How many digits can we replace @ with, so that the number 20@02019 is not greater than 20202020?

Problem 5. Replace the question mark in the following expression with a number, so that the equation would be correct.
$$4 \times 2020 \; = ? + 2016 + 2017 + 2018 + 2019$$

Problem 6. It takes me 1 hour and 30 minutes to travel 150 km with my car. How many km will I travel in 9 hours if I travel at the same speed?

Problem 7. There are 9 girls in a class and their number is equal to half the boys in this class. The number of students in the entire school is 23 times greater than the number of students in this class. How many students are there in the school?

Problem 8. How many of the symbols „+" must be swapped with symbols „×", so that the equation below would be correct?
$$121 + 123 + 14 + 15 = 454$$

Problem 9. In how many ways can we remove 2 digits in order for the product of $101 \times 102 \times 103 \times 104 \times 105$ to be the least possible?

(the order of removing digits is not important)

Problem 10. At least how many identical balls (more than 1), can be arranged both in the shape of a triangle and in the shape of a square?

1+2   1+2+3   1+2+3+4   1+2+3+4+5

2x2=4   3x3=9   4x4=16   5x5=25
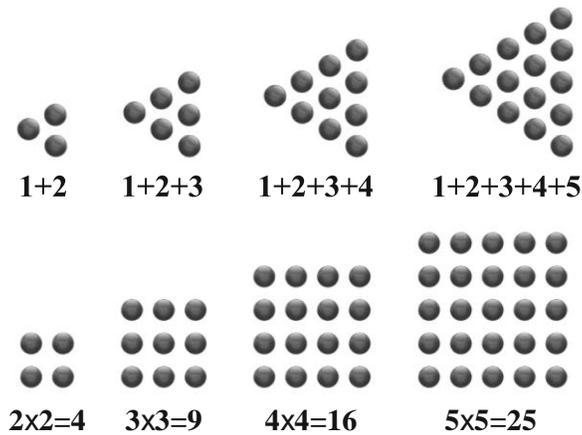
Problem 11. I have 11 apples. I also have scales, which I can use to measure the total weight of each two of the three apples. (I cannot measure one apple at a time.) What is the least number of times I need to weigh the apples in order to find out the total weight of all 11 apples?

Problem 12. There are 8 green and 11 yellow points on a plane. I connected each two of them with a line segment. How many of these line segments have endpoints of the same colour?

Problem 13. 16 points have been placed at equal distances along a circle. They have been numbered 1, 2, 3, …,15, 16, respectively. What is the number of the point that is opposite point 7?


10   9   8
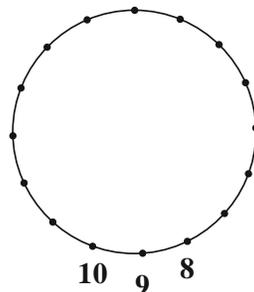
Problem 14. Find the area of a rectangle in cm² if one of its sides has a length of 4 cm and the difference of the length of two of its adjacent sides is 2 cm.

Problem 15. How many triangles are there that have 3 of the following 5 points as their vertices?
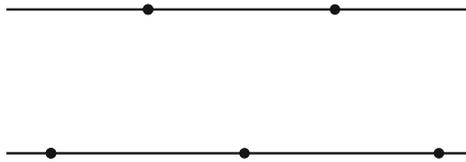
Problem 16. The digits 3, 4 and A have been used to write down all possible three-digit numbers made up of different digits. The sum of these numbers is 1477. Find the digit A.

Problem 17. I drew a square with a side length equal to the natural number N in cm. I then divided it into small identical squares with a side length of 1 cm. I also drew its diagonals and discovered that they are diagonals of 9 squares 1x1. Calculate N.
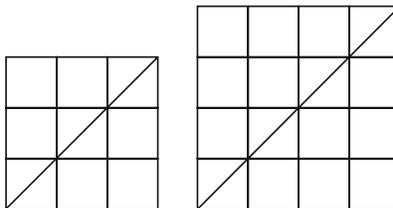
Problem 18. A turtle can travel the distance of 24 meters in 12 minutes. How many meters will the same turtle travel in 1 hour and 4 minutes if it moves at the same speed?

Problem 19. Write down all possible sums of the natural numbers A, B, C and D which have a product of 91.

Problem 20. A three-digit number contains 1 zero. If we were to remove the zero, the number would be 9 times smaller. What is the three-digit number?