MATHEMATICS WITHOUT BORDERS
WINTER 2019
AGE GROUP 6

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. For which natural number x is the following inequality correct?

$$\frac{2}{5} < \frac{x}{10} < \frac{3}{5}.$$

Problem 2. $\frac{3}{8}$ of all students in a class are girls. What percentage of all students in this class are boys?

Problem 3. Calculate the sum of all prime factors of 403.

Problem 4. Find the midpoint of the line segment with endpoints $(-\frac{2}{3})$ and 1.

Problem 5. If A and B are integers, for which $|A| < 3$ and $|B| < 4$, find the greatest value of the expression $3 \times A - 4 \times B$.

Problem 6. The product of the natural numbers from 19 to N is divisible by 1 000, but is not divisible by 10 000. What is the greatest value of N?

Problem 7. There were exactly four Mondays and exactly four Fridays in a particular January. What day of the week did the 1st of January fall on during this year?

Problem 8. All natural numbers divisible by 3 and by 2, namely 6, 12, 18, etc., have been written down.
The sum of the digits of each of these numbers is written underneath them. In which place in the second row will you first see the number 27?

Problem 9. The product of 7 integers is -1 and their sum is smaller than -3. Find the sum of these numbers.

Problem 10. The sum A of 4 of the following numbers: 36, 1, 2, 3, 4, 5, 7, 8 and 12, is three times greater than the sum B of another set of 4 of these numbers. Calculate $A - B$.

Problem 11. How many line segments are there that connect 2 vertices of a 12 sided polygon, if these line segments are NOT sides of the 12 sided polygon?

Problem 12. What is the greatest number of intersections that 5 straight lines in a plane can have?

Задача 13. A rectangle with a perimeter of 60 cm has been divided into two identical rectangles, each with a perimeter of 38 cm. Find the area of the original rectangle in cm^2.

Problem 14. The areas of two squares are 3481 cm^2 and 1681 cm^2, respectively. Find the difference of their perimeter in centimetres.

Problem 15. We have 5 line segments. The first segment intersects 2 of the others. The second one intersects 3 of the others. The third one intersects 4 of the others. The fourth one intersects 4 of the others. Which segments does the fifth segment intersect?

Problem 16. Three metal cubes with edges of 3 cm, 4 cm and 5cm, respectively, have been melted in order to form a new cube. Find the edge of the new cube in centimetres.

Problem 17. How many four-digit numbers are there, which are made up of even digits and are divisible by 4?

Problem 18. The odd numbers from 1 to 99 have been written down on index cards. At least how many cards should we pick (without looking) so that there would be at least one number among them that is divisible by 5?

Problem 19. How many different remainders can we get when dividing 2019 by a one-digit number?

Problem 20. For how many integers a is the number a^2 a two-digit number?