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. An object is moving at a constant speed of 0.001 m/s. How many centimetres will this object travel in a full day (day and night)?

Problem 2. Calculate the number A, if $222^2 - 443 = A^2$.

**Problem 3.** Calculate $25x^3 - x^2$, if $x = 0.04$.

Problem 4. Find the sum of all prime numbers that are factors of $2^{2019} + 2^{2018} + 2^{2017}$.

Problem 5. Find the largest number of 14 different natural numbers with a sum of 106.

Problem 6. A pyramid has 18 vertices. How many edges does it have?

Problem 7. Two identical cubes have been used to form a rectangular cuboid with a total surface area of 1440 cm^2. Find the volume of the cuboid in cm^3.

Problem 8. A rectangle has been divided into four smaller rectangles with areas 1, 2, 6 and X. Find the greatest possible value of X.
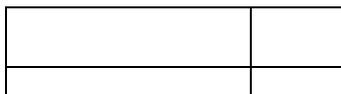
Problem 9. The difference of the acute angles of a right-angled triangle is 60^0, and its area is 72 cm^2. Find the hypotenuse of the triangle in centimetres.

Problem 10. There are 20 dots inside a square. What is the greatest number of non-overlapping triangles that can be formed that have the given dots and the vertices of the square as their vertices?

Problem 11. If x is a natural number, calculate the remainders left after dividing $x^3 - x$ by 12.

Problem 12. Calculate
$$1 - x + |x - 1| + 2 - x + |x - 2| + \cdots + 14 - x + |x - 14| + 15 - x + |x - 15|,$$
if $x = 10.1$

Problem 13. If $\overline{ab}$ and $\overline{ba}$ are two-digit numbers, how many three-digit numbers x are there such that $x = (\overline{ab})^2 - (\overline{ba})^2$?

Problem 14. Find x, if
$$4 \times 10^5 + 10^4 + x \times 10^2 + 10^1 + 1 + 3 \times 10^{-1} + 2 \times 10^{-3} = 411311.302.$$

Problem 15. Ivan wrote down all odd numbers up to 2019: 1, 3, 5, ..., 2015, 2017, 2019. Then Peter erased all numbers that are divisible by 3. How many numbers are left?

Problem 16. If $2019! = 1 \times 2 \times 3 \times ... \times 2018 \times 2019$, find all values of the natural number N, for which 2019^N is a factor of $2019!$.

Problem 17. Calculate x, if
$$9 \times 11 \times (10^8 + 10^6 + 10^4 + 10^2 + 1) + 1 = 100^x.$$

Problem 18. How many numbers a are there, for which both $\left(-\frac{3}{a}\right)$, and $\left(2a - \frac{3}{a}\right)$ are integers.

Problem 19. The digits 3 and 4 were used to form all 4-digit numbers that satisfy the following conditions:

- no two digits 3 are adjacent
- the number must contain both the digit 3 and the digit 4

How many such numbers are there?

Problem 20. The following figure shows an unfolded cube. The faces of the cube have been numbered using the numbers from 1 to 6. Find the greatest sum of the numbers that have been written on three faces that share the same vertex.