



MATHEMATICS WITHOUT BORDERS

AGE GROUP 4

AUTUMN 2018

INSTRUCTIONS

1. Please DO NOT open the test papers before receiving the proctor's permission.
2. The test contains 20 problems with open answers.
3. You must write down your answers in the ANSWER SHEET.
4. You will get 2 points for each correct answer, 1 point for an incomplete answer, and 0 points for a wrong or missing answer.
5. Using calculators, phones or other electronic devices, as well as books or formula sheets is NOT ALLOWED.
6. You have 60 minutes to complete the test. In the case of two students having the same number of points, the student who completed the test quicker will get a higher ranking place.
7. Taking the test papers and any other notes out of the room is NOT ALLOWED.
8. Receiving any help from a proctor or anyone else during the competition is NOT ALLOWED. The organisers insist on honesty and fair play on the part of all participants in the tournament.

GOOD LUCK!

Arithmetics

Problem 1. Insert brackets in the expression below so that it would be correct:

$$100 - 2 \times 22 + 28 = 0.$$

Write down your full answer in the answer sheet.

Problem 2. Find the tens digit of the number equal to $20 \times 18 + 2018$?

Problem 3. How many odd two-digit numbers are there, smaller than 88?

Problem 4. Ivan wrote down the greatest five-digit number. Peter wrote down the smallest four-digit number made up of different digits. By how much is the number Ivan wrote down greater than the number Peter wrote down?

Problem 5. Ivan calculated the sum of the numbers that have exactly 7 tens and less than 78 ones. Peter expressed that same sum as the product of two numbers, one of which is 4. What is the other factor?

Logical Thinking

Problem 6. The students from a class are standing in rows of 4 students each. Peter counted the rows and found that there were 3 rows in front of him and 3 rows behind him. How many students are there in total? (Peter is one of the students.)

Problem 7. Alec, Boris and Claire took part in a mathematics contest and all got different points. Their friend Steven asked them how many points they got. Here are their guesses:

Alec: „*Claire has the most points.*”

Boris: „*Alec has the most points.*”

Claire: „*I have the most points.*”

Who won if only one of them guessed right?

Problem 8. I used the numbers from 1 to 40 and got the following number:

$$12345678910111213\dots37383940.$$

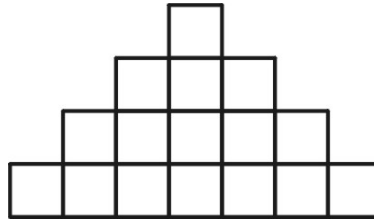
Remove 66 of the digits in order to get the greatest possible number. What is the number?

Problem 9. The numbers 1, 2, 4, 7 and 8 have been written on a whiteboard. Steven and Peter removed two numbers each. The sum of the numbers that Steven removed is three times greater than the sum of the numbers Peter removed. Which of the numbers is left on the board?

Problem 10. There are 2018 numbers to the left of the number A and 18 numbers to its right. How many numbers are there between this number A and the number in the middle?

Geometry

Problem 11. How many squares are there on the diagram below?



Problem 12. The side lengths of a triangle are expressed in centimeters, using natural numbers. Only two of them are equal. If the perimeter of this triangle is 12 cm, find the length of the smallest side of this triangle.

(Hint: The sum of any two side lengths of a triangle is always greater than the third side.)

Problem 13. The distance between each two neighboring pillars in each row in a vineyard is the same. If the distance between the first and the fifteenth pillar in one of the rows is 28 meters, calculate the distance between the seventh and the 28th pillar in this row (in meters).

Problem 14. A rectangle is made up of three identical squares. The perimeter of the rectangle is greater than the perimeter of the square by 160 mm. How many centimeters is the perimeter of the square?

Problem 15. The figure below is made up of 5 cubes. If the entire figure has been painted in blue or in yellow, how many of the faces of the cubes have not been painted?



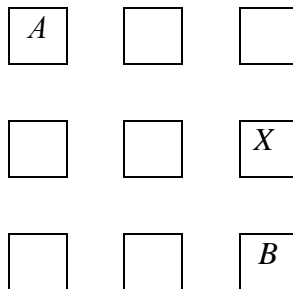
Combinatorics

Problem 16. Five students are participating in a competition. Only the best two students will receive awards. If the awards are identical, in how many different ways can they be distributed?

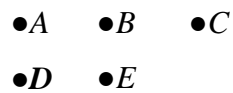
Problem 17. How many even two-digit numbers are there that are divisible by 5?

Problem 18. We must arrange 4 books on a bookshelf. Two of the books must always be next to one another. In how many ways can we arrange the books?

Problem 19. When moving along the rectangles, we can go only downward and right. We are not allowed to go through the rectangle marked X . In how many ways can we get from rectangle A to rectangle B ?



Problem 20. How many triangles are there that have 3 of the following 5 points as their vertices?



(The points A , B and C lie on a straight line.)