# Spring Final ORMC Game

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June 2021

Rules are easy:

You have 2 attempts for problem. If you solve the problem with your first attempt – you get 10 points. If you solve it from your second attempt – you get 5 points.

## 1 Problems

1. Kolya was supposed to multiply a single-digit number and a two-digit one, but instead, he wrote them down in a row and got a three-digit number, which turned out to be three times more than the product that he was supposed to compute. What numbers could Kolya have? (list all the possibilities)

2. What is the largest number of obtuse angles that nine rays emanating from one point can form on a plane?

3. The three sides of the trapezoid are equal, and one of the angles is $40^\circ$ larger than the other. Find an acute angle between the diagonals of the trapezoid.

4. In a cyclic quadrilateral $ABCD$ angle $ABD$ is $30^\circ$ and angle $BCA$ is $42^\circ$. Find $\angle DAB$.

5. Represent the number 2021 as a sum of four natural numbers so that all the digits in these numbers are different.

6. All faces of the cube are painted in different colors (each face is painted with the same color). If you look at this cube from one side, then you can see the blue, white and yellow faces, on the other side you can see the black, blue and red faces, and on the third side you can see the green, black and white faces. Which face is opposite to the white one?

7. A huge military band performed in the field. First, the musicians lined up in a square. Then they rearranged themselves into a rectangle, and the number of ranks increased by 5. How many musicians were in the orchestra?

8. Find the largest natural number in which each internal digit is greater than half the sum of the two adjacent digits.

9. In triangle $ABC$, angle $B$ is $20^\circ$, and angle $C$ is $40^\circ$. The bisector $AD$ of angle $A$ is 12. Find the difference between the sides BC and AB.

10. In the cells of a $5 \times 5$ square, the numbers are arranged so that the sums of the numbers in all rows and in all columns are the same. The sum of all the numbers in the upper left $2 \times 2$ square is 10, and in the lower right $3 \times 3$ square is 15. Find the sum of all the numbers in the table.

11. Several natural numbers, consisting only of ones (like 1 or 1111), were added together, and the result was the number 2021. Find the smallest possible number of terms.

12. What is the largest number of sides a polygon that is the intersection of a quadrilateral and a triangle can have?

13. Sophia bought a Greyhound ticket, but then her plans changed and she sold it back for \$24. The percent of the ticket's cost that she lost in the sale is equal to the dollar value of her initial ticket. How much did she buy it for? (list all options)

14. Find the largest ten-digit number whose first digit is divisible by 1, the second by 2, ..., the tenth by 10.

15. How do you cut the cake into 6 pieces so that it can be distributed equally to both three guests and four guests?

16. Find any natural numbers $a$ and $b$ such that the fractions $\frac{a}{b}$, $\frac{a+1}{b}$, $\frac{a+1}{b+1}$ are irreducible (i.e., already in lowest terms).

17. The numbers $1, 2, \ldots, 25$ are written out in a $5 \times 5$ table so that in each line the numbers are arranged in ascending order. What is the largest value that the sum of the numbers in the third column can take?

18. Find the smallest natural number whose sum and product of digits are equal to 80.

19. The math teacher uses a problem book, which contains one hundred problems with numbers from 1 to 100. At the beginning of each lesson, the teacher attaches the numbers of three problems to the magnetic board. To do this, he uses magnets in form of digits. What is the smallest number of magnets a teacher needs to buy so that he can compose the numbers of any three problems from this book? (digit 6 can be flipped)

20. On the first day the grocery store sold 1/2 of all the geese and half a goose, on the second – 1/3 of the remainder and another 1/3 of the goose, on the third – 1/4 of the new remnant and another 3/4 of the goose, on the fourth – 1/5 of the remainder and another 1/5 of the goose. On the fifth day, the store sold the remaining 19 geese. How many geese were there in the store?

21. Arrange the numbers in ascending order $\left(-\frac{2}{3}\right)^1$, $\left(-\frac{2}{3}\right)^2$, $\left(-\frac{2}{3}\right)^3$, $\left(-\frac{2}{3}\right)^4$.