

# Combinatorics and Logic

## Junior League

1. How to rearrange the numbers  $1, 2, \dots, 2017$  into a sequence  $a_1, a_2, \dots, a_{2017}$  such that expression

$$1 \cdot a_1 + 2 \cdot a_2 + \dots + 2017 \cdot a_{2017}$$

would hold minimal value?

(*I. N. Sergeev*)

2. In a dark storage room 24 slippers are scattered that originally formed 12 pairs of 3 different colours and 4 different styles (all pairs were different from each other). What is the least number of slippers that salesman should take from the room to be sure that he can show a customer two pairs of slippers of different style and colour?

(*S. B. Gashkov*)

3. Is it possible from any increasing sequence of positive integers to select a *subsequence* (i. e., thin it out by removing some elements), such that either of two conditions would hold:

- (1) every element is divisible by every lesser element;
- (2) or every element is divisible by no other element.

(*I. N. Sergeev*)

4. Five different gift sets are arranged from souvenirs of 6 kinds, each set contains 3 different souvenirs. Is it possible to state for sure that some two of these gift sets contain *exactly* 1 common souvenir?

(*S. B. Gashkov*)

5. 30 red and 50 green stones lie on a table. Two players, Petya and Vasya, take turns: each turn a player picks a color and removes an arbitrary (at his choice) number of stones of this color that is a divisor of the number of stones of the other color (zero is divisible by every positive integer). Whoever takes the last stone wins. Who has a guaranteed win, given that Petya is first? (*suggested by I. A. Sheipak*)