MATHEMATICS COMPETITION FOR THE SEVENTH
GRADERS OF SATAKUNTA, 5–9 MARCH, 2018

- The time allotted is 50 minutes.
- The allowed tools are writing and drawing instruments, i.e. pencil, paper, eraser, ruler and compass. Calculators and mathematical tables are not allowed.
- Each problem is worth one point. Wrong answers are not punished.
- The problems are not ordered in increasing difficulty, but the first problems are likely to be easier than the last ones.

1. Compute $1 - 20 + 3$.

    a) -16 **b)** -5 **c)** 0 **d)** 16 **e)** 24

2. Order the numbers 0.25, 1 and $\frac{1}{10}$ in increasing order.

    a) $0.25 < 1 < \frac{1}{10}$ **b)** $0.25 < \frac{1}{10} < 1$ **c)** $1 < 0.25 < \frac{1}{10}$
    d) $\frac{1}{10} < 1 < 0.25$ **e)** $\frac{1}{10} < 0.25 < 1$

3. A cookbook instructs one to use 6 decilitres of milk when baking 50 muffins. How many litres of milk is required to bake 75 muffins?

    a) 0.9 **b)** 1 **c)** 1.1 **d)** 1.2 **e)** 1.3

4. The Finnish flag consists of a white background with a blue cross. The height of the flag is 11 units, its width is 18 and the width of each leg of the cross is 3, as in the picture. What is the area of the cross (in squares of the unit)?

    a) 69 **b)** 78 **c)** 81 **d)** 84 **e)** 87
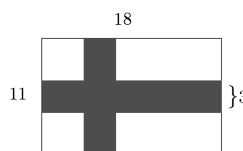
5. Let us consider the plane with the usual cartesian coordinates. In the beginning we are at the point $(0,0)$. In one step we move either one unit to the right or one unit up. For example, from the point $(0,0)$ we may move either to the point $(1,0)$ or to the point $(0,1)$. Which of the following points can be reached in exactly 2018 steps?

    a) $(0,0)$ **b)** $(10,1000)$ **c)** $(18,2000)$ **d)** $(1010,1007)$ **e)** $(1015,1015)$

6. Let A be a positive integer. When A is multiplied by two, the result is a number whose first digit is 3. What is the first digit of A?

    a) 1 **b)** 2 **c)** 3 **d)** 6 **e)** This situation is not possible.

7. A basket contains 10 yellow, 10 blue and 10 red balls. Balls are removed from the basket one at a time, and a removed ball cannot be put back in the basket. What is the least number of balls that must be taken from the basket if we want to be certain that at least two balls of the same color have been removed?

    a) 2 **b)** 3 **c)** 4 **d)** 10 **e)** 30

8. Ten students estimate the price of a liter of milk. Their estimates are

$$84, 85, 87, 90, 92, 94, 96, 99, 101 \text{ and } 103$$

cents. In the grocery story it turns out that at least half of the students estimated the price too high, that the price in cents is divisible by three and that two students gave estimates differing from the truth by only one cent. How many cents did a liter of milk cost?

a) 87   **b)** 91   **c)** 93   **d)** 96   **e)** 102

9. Let $ABCD$ be a rectangle, let the point E lie on the side AB, and suppose that $\angle AED = 70°$ and $\angle ECD = 50°$. Compute $\angle DEC$.

a) $50°$ **b)** $60°$ **c)** $70°$ **d)** $80°$ **e)** $90°$

10. Let us consider the numbers 0, 1, 2, 3, 4 and 5. In how many ways can we delete two of these numbers, if the last digit of the sum of the remaining numbers must be 1?
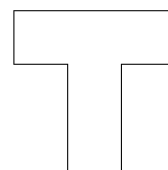
a) 0   **b)** 1   **c)** 2   **d)** 3   **e)** 4

11. Let us define a new operation $\star$ by setting $a \star b = a + 2b$. What is $6 \star 2$?

**a)** 0   **b)** 2   **c)** 4   **d)** 7   **e)** 10

12. There is a letter T in the picture, and its width is 5 and its height is 7. All the angles are right angles. Determine the length of the boundary line.

a) 24   **b)** 20   **c)** 17   **d)** 28
e) The problem cannot be solved with the given data.

13. The balance in the picture is in equilibrium, and its total mass is 100 g. What are the masses of the weights?

a) Each weight has the mass 10 g.
b) A square has the mass 10 g, a circle 15 g, and a triangle 10 g.
c) A square has the mass 10 g, a circle 5 g, and a triangle 15 g.
d) A square has the mass 20 g, a circle 10 g, and a triangle 5 g.
e) Each weight has the mass 15 g.
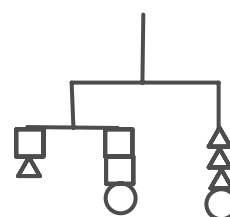
14. The number 2018 is written as the sum of 1011 positive integers. Which of the following are possible values for the number of odd terms in the sum?

a) 0 and 1011   **b)** 2 and 100   **c)** 8 and 500   **d)** 99 and 1010   **e)** All of the previous

15. There are 15 points in the plane. Two different points are either connected by drawing a line, or not. This is done for all pairs of points. In how many ways can we connect the points if it is required that ten of the points are each connected to exactly two other points, one of the points is connected to exactly three other points, and four of the points are each connected to exactly four other points?

a) 0   **b)** 1   **c)** 15   **c)** 63   **e)** 100