Mathematics Competition for the Seventh Graders of Satakunta, 4–8 March, 2019

- 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 $49 - 2 + 7 \cdot 10$.

a) -89 **b)** 46 **c)** 94 **d)** 117 **e)** 681

2. An airplane from Helsinki to Singapore takes off at 23:55 and flies for 11 hours and 30 minutes. When the plane lands, the local time in Singapore is 17:25. What is the time difference between Helsinki and Singapore?

a) 5.5 hours **b)** 6.0 hours **c)** 6.5 hours **d)** 11.5 hours **e)** 17.5 hours

3. How many percent is the number 12 of the number 75?

a) 6.25 % **b)** 12.00 % **c)** 16.00 % **d)** 19.05 % **e)** 63.00 %

4. A swimming pool has the shape of a rectangular parallelepiped, its depth is 2.5 meters, its length is 25 meters and its width is 10 meters. It is filled with two meters of water at the pumping rate of 100 liters per minute. How many minutes does the operation take?
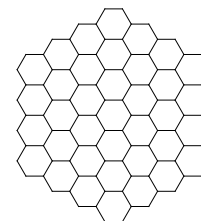
a) 5 **b)** 250 **c)** 500 **d)** 2500 **e)** 5000

5. In three years Hanna will be twice as old as her cousin Ella will be. Ella is now 15 years old. How old is Hanna now?

a) 30 years **b)** 36 years **c)** 27 years **d)** 39 years **e)** 33 years

6. How many small hexagons (of equal size) are there in the following diagram?

a) 19 **b)** 28 **c)** 37 **d)** 46 **e)** Even more

7. We have 2019 positive integers with a total sum 10 000. What is the largest number which could appear among the 2019 integers?

a) 4 **b)** 5 **c)** 3417 **d)** 7982 **e)** 10 000

8. The average of three numbers is 10 and the average of two other numbers is 5. What is the average of all five numbers?

a) 3 **b)** 5 **c)** 6.5 **d)** 7.5 **e)** 8

9. A mathematician has a room two meters wide and five meters long. She wishes to tile the floor using white $1\,\text{m} \times 1\,\text{m}$ tiles and black $2\,\text{m} \times 2\,\text{m}$ tiles. How many different possibilities are there for the number of black tiles in a tiling? (It is not necessary to use any black tiles at all.)
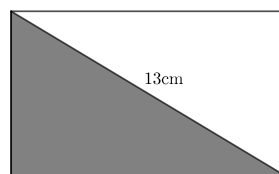
   a) 0   **b)** 1   **c)** 2   **d)** 3   **e)** 4

10. What is the last digit of the number $2015 \cdot 2016 \cdot 2017 \cdot 2018 \cdot 2019$?

   a) 0   **b)** 1   **c)** 2   **d)** 3   **e)** 5

11. The circumference of the rectangle below is $34\,\text{cm}$ and its diagonal has the length $13\,\text{cm}$. What is the area of the diagram's shaded triangle?

   a) $26\,\text{cm}$ **b)** $30\,\text{cm}$ **c)** $34\,\text{cm}$ **d)** $38\,\text{cm}$
   e) The problem cannot be solved with the given data.

13cm

12. In a book the first page has the page number 1, the second page 2, the third page 3, and so on. All the page numbers of the book required a total of 195 digits. How many pages does the book have? (Please note that, for example, the number 1 has one digit, the number 11 has two digits, and the number 123 has three digits.)
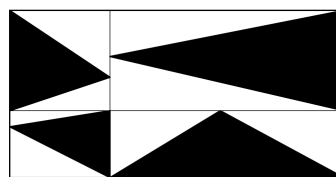
   a) 98   **b)** 101   **c)** 150   **d)** 167   **e)** 195

13. In a certain year, the month of March has exactly four Mondays and four Fridays. What day of the week is the 31st day of March?
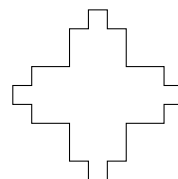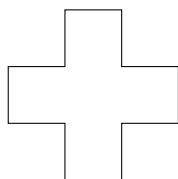
   a) Monday   **b)** Tuesday   **c)** Wednesday   **d)** Thursday   **e)** Friday

14. The area of a rectangle is 1 and it has been divided into four parts by segments parallel to the sides. Compute the area of the black region.

   a) $\frac{1}{4}$ **b)** $\frac{3}{8}$ **c)** $\frac{1}{3}$ **d)** $\frac{7}{16}$ **e)** $\frac{1}{2}$

15. A sheet of paper has the shape of a square. In the first round, small squares are cut from the corners, so that the resulting polygon has 12 corners as in the diagram below. In the second round, small squares are again cut from the $90°$ corners so that the resulting polygon has 28 corners. In each round, we keep repeating this operation of cutting small squares from the $90°$ corners. How many corners (both $90°$ and $270°$ corners) the polygon has after the fifth round of cutting?

   a) 68   **b)** 100   **c)** 124   **d)** 128   **e)** 252