# Mathematics Competition for the Seventh Graders of Turku Region, 29 February – 4 March, 2016

- The time allotted is 50 minutes.
- The allowed tools are writing and drawing instruments, i.e. pencil, 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 $140 \cdot 12 - 130 \cdot 11$.

a) 50   **b)** 100   **c)** 150   **d)** 200   **e)** 250

2. The following figure is colored with three colors so that each cell is colored with exactly one color, and if two cells have some part of their boundaries in common, then they must be colored with different colors. How many ways of coloring the figure are there?
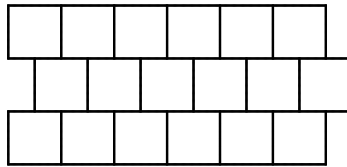
a) 1   **b)** 2   **c)** 3   **d)** 6   **e)** 60

3. Compute $(a + b)^2 - (a - b)^2$, when $a = 22$ and $b = 10$. Of course, here x^2 means the product $x \cdot x$.

a) 480   **b)** 580   **c)** 680   **d)** 880   **e)** 1080

4. The sum of two unknown numbers is 24 and their difference is 2. What is their product?

a) 111   **b)** 112   **c)** 143   **d)** 155   **e)** 156

5. Two cars start driving from same place to opposite directions. They first drive one kilometer straight, then turn 90° left from their directions, drive three kilometers straight, and then turn again 90° left from their directions, and drive one kilometer straight. How far away from each other are the cars in the end?

a) 6 km   **b)** 7 km   **c)** 8 km   **d)** 9 km   **e)** 10 km

6. What is the last digit of the number $7^7 = 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$?

a) 7   **b)** 1   **c)** 5   **d)** 9   **e)** 3

7. A pot of water half filled by water weighs 500 g and when it is full it weighs 950 g. How much weighs the water in a full pot of water?

a) 500 g   **b)** 800 g   **c)** 1000 g   **d)** 950 g   **e)** 900 g

8. Determine the area of the colored region. In the figure, there is a square with sides of length 1, in which we have left white the right-angled triangles reaching from the upper corners to the middle of the lower side as well as from the upper side to the center point.

a) $\frac{1}{8}$ **b)** $\frac{1}{3}$ **c)** $\frac{1}{5}$ **d)** $\frac{1}{4}$ **e)** $\frac{1}{2}$

9. On the first row, we write the lonely number 1. On the second row we write the numbers 2, 3 and 4 so that the number 3 is right under 1. In the same vein, on the third row, we write the numbers 5, 6, 7, 8 and 9 so that the number 7 is under 3. By continuing this way, we get a figure as follows:

$$
\begin{array}{ccccc}
 & & 1 & & \\
 & 2 & 3 & 4 & \\
5 & 6 & 7 & 8 & 9 \\
\cdots & \cdots & \cdots & \cdots & \cdots
\end{array}
$$

What is the leftmost number on the tenth row of the figure?

a) 81 **b)** 82 **c)** 99 **d)** 100 **e)** 101

10. The following figure depicts a large equilateral triange, whose circumference is 42, and 15 small equilateral triangles. What is the circumference of the entire figure?
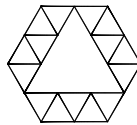
a) 45 **b)** 46 **c)** 48 **d)** 50 **e)** 56

11. A point P lies inside a triangle $AA'A''$. Two half-lines emanate from P in an angle of $120°$. The half-lines intersect perpendicularly the sides AA' and $A'A''$ of the triangle at points P' and P'', respectively. Furthermore, we know that $AP' = P'A'$, $A'P'' = P''A''$ and $AA' = A'A''$. How large are the angles of the pentagon $AP'PP''A''$?
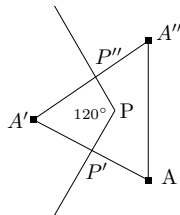
a) $60°, 60°, 90°, 90°, 240°$
b) $60°, 80°, 90°, 90°, 240°$
c) $80°, 90°, 90°, 120°, 160°$
d) $80°, 80°, 90°, 90°, 240°$
e) $90°, 90°, 120°, 120°, 120°$

12. In the number $3943023x$ the last digit has been written unclearly, but we know that the number itself is divisible by six. What are the possible values of x?

a) 0 and 6 **b)** 0 and 8 **c)** 1 and 7 **d)** 1 and 9 **e)** 2 and 6

13. What is the remainder when the number $A = 1 + 2 + 3 + 4 + 5 + \ldots + 2016$ is divided by the number 5?

a) 0 **b)** 1 **c)** 2 **d)** 3 **e)** 4

14. Power means that a number is multiplied by itself as many times as indicated by the number in the upper right-hand corner. For example, we have $5^2 = 5 \cdot 5$ and $7^3 = 7 \cdot 7 \cdot 7$. What is the correct order of sizes?

a) $5^{10} \cdot 3^{10} < 4^{20} < 2^{41}$ **b)** $2^{41} < 4^{20} < 5^{10} \cdot 3^{10}$ **c)** $5^{10} \cdot 3^{10} < 2^{41} < 4^{20}$
d) $4^{20} < 5^{10} \cdot 3^{10} < 2^{41}$ **e)** $4^{20} < 2^{41} < 5^{10} \cdot 3^{10}$

15. What is the centermost digit in the product $9688072645684032 \cdot 125$?

a) 0 **b)** 1 **c)** 2 **d)** 3 **e)** 4