MATHEMATICS COMPETITION FOR THE SEVENTH GRADERS OF TURKU REGION, 27 FEBRUARY – 3 MARCH, 2017

- 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 369 248.
 - a) 101 b) 120 c) 121 d) 130 e) 137
- **2.** Compute $2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8 \cdot 9 \cdot 0$.

a) 1000 b) 0 c) 12345 d) 1760 e) 429

3. Compute $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$.

a) 2350 b) 32925 c) 330510 d) 900000 e) 12000000

4. A big box contains 50 kg of gummy bears when full. Making the box (floor, walls, lid) took 2 m^2 of cardboard. How much cardboard is required to make a box which has the same dimensions but can contain 400 kg of gummy bears?

a) 4 m^2 **b)** 6 m^2 **c)** 8 m^2 **d)** 16 m^2 **e)** 20 m^2

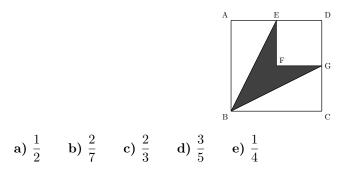
5. We have a 10 litre bucket and a 100 litre tub at our disposal. Which of the following water litre amounts can we measure using these two vessels?

a) 1, 15 and 20 b) 5 and 10 c) 62 d) 20 and 60 e) All of the previous.

6. We wish to build a fence around a rectangular region with area 100 m^2 . Which of the following options requires the least work on fencing?

a) $5 \text{ m} \times 20 \text{ m}$ **b**) $10 \text{ m} \times 10 \text{ m}$ **c**) $1 \text{ m} \times 100 \text{ m}$ **d**) $25 \text{ m} \times 4 \text{ m}$ **e**) $2 \text{ m} \times 50 \text{ m}$

7. The figure ABCD is a square. The point E is the midpoint of the segment AD, G is the midpoint of the segment CD and F is the center of the square. How large a portion of the square has been colored?



8. The point O is the center of the circle in the following picture, the lines ℓ and s are its tangents and they intersect at an angle of 50° at the point P. How large is the angle α ?

- **a)** 100°
- **b)** 130°
- c) 155°
- **d)** 170°
- **e)** 200°

a) 2

9. There are 21 kids in a daycare group, and each of them speaks at least one language. We know that five of the kids speak at least Finnish and Russian, six of them speak at least Finnish and Swedish, and three of them speak at least Swedish and Russian. Furthermore, we also know that two of the kids speak Finnish, Swedish and Russian, and no one speaks other languages. How many of the kids speak exactly one language?

a) problem not soluble with the given data b) none of them c) 10 d) 8 e) 11

10. If we have three different circles, how many points can lie on all of the three circles?

a) Only 0 b) 0, 1 or 2 c) 0, 1, 2 or 3 d) 0, 1, 2 or 4 e) 0, 1, 2, 3 or 4

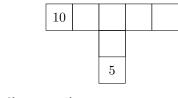
11. Compute $2^{2017} - 2^{2016}$. Here 2^n means the product $2 \cdot 2 \cdot 2 \cdot \ldots \cdot 2$, where the number 2 appears *n* times.

a) 1 **b)** 2 **c)** $2^{\frac{2016}{2017}}$ **d)** 2^{2016} **e)** None of the previous.

12. Let us define a new operation on numbers using the familiar addition and multiplication: $a \oplus b = 3a - b$. For example, $5 \oplus 6 = 3 \cdot 5 - 6 = 9$. What is

 $\oplus 2)?$

13. In the following grid, two cells have been filled with the numbers 10 and 5. The remaining cells are filled using the numbers 1, 2, ..., 9. No two cells are allowed to contain the same number. Furthermore, on the upper row, the numbers must be in decreasing order from left to right, and on the center column the numbers must be decreasing from up to down. In how many ways can we fill the grid under these restrictions?



a) 0 **b**) 1 **c**) 5 **d**) 16 **e**) 32

14. The difference of two positive integers is ten. When they are multiplied, the result is one of the following five numbers. Which of them?

a) 372 b) 375 c) 382 d) 383 e) 387

15. The mathematician Augustus de Morgan was born and died during the 19th century (i.e. between 1800 and 1899). He celebrated his *x*th birthday in the year $x \cdot x$. In which year was de Morgan born? For example, we cannot have x = 40, because then de Morgan would have celebrated a birthday in the year $40 \cdot 40 = 1600$, and had he been 40 years he would have been born already in 1560 = 1600 - 40.

a) 1800 b) 1806 c) there are several possibilities d) 1848 e) 1849

