Mathematics Competition for the Seventh Graders of Turku region, 9–13 February 2015

- 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 $522 - 278$.

    a) 233   **b)** 234   **c)** 235   **d)** 238   **e)** 244

2. Compute $27 \cdot 66$.

    a) 1583   **b)** 1582   **c)** 1682   **d)** 1782   **e)** 1882

3. If $S = 4 \cdot 10000 + 1 \cdot 1000 + 6 \cdot 10 + 3 \cdot 1$, then $S =$

    a) 4163   **b)** 41063   **c)** 41631   **d)** 41603   **e)** 40163

4. Which of the following fractions is the largest?

    a) $\dfrac{5}{8}$ **b)** $\dfrac{14}{17}$ **c)** $\dfrac{97}{100}$ **d)** $\dfrac{52}{55}$ **e)** $\dfrac{12}{15}$

5. At 11:30 a train was in Tuusula which is 30 kilometres away from Pasila. The train moves at $120\,\mathrm{km/h}$ between stops, and otherwise the stops between Tuusula and Pasila take 5 minutes. When does the train arrive to Pasila?

    a) 11:40   **b)** 11:50   **c)** 12:00   **d)** 12:10   **e)** 12:20

6. A population of bacteria lives in a petri dish. The population doubles every two minutes. At 12 o'clock noon the dish is completely full. When was the dish half full?

    a) 11:58   **b)** 11:56   **c)** 11:30   **d)** 6:00
   **e)** The problem cannot be solved with the given data.

7. Let us throw an ordinary die with six faces. What is the probability of obtaining an even result which is greater than three?

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

8. If $P = 1$ and $Q = 2$, then which of the following is **not** an integer?

    a) $P + Q$ **b)** $\dfrac{P}{Q}$ **c)** $\dfrac{Q}{P}$ **d)** PQ **e)** P^Q

9. A big $4 \times 4 \times 4$ cube is dissected into eight little $2 \times 2 \times 2$ cubes. What is the sum of the areas of the little cubes?

4

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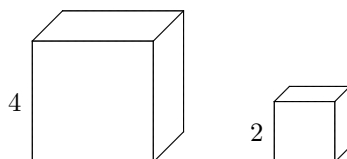
a) 191   **b)** 192   **c)** 200   **d)** 204   **e)** 208

10. John has a sheet of paper with the number 2014 written on it. He plays the following solitary game. On each round he replaces the old number with a new one according to the following rules. If the old number is even, he divides it by two. Or, if the old number is odd, then he multiplies it by three and adds one to the product. After the calculations, he writes the result on paper. Which number will John write on the paper after 5 rounds?

a) $(3 \cdot 1024 + 1)^5 = 274039269576686593$
b) $2^5 = 32$ **c)** 2551   **d)** 10204   **e)** 2267

11. The following figure depicts a triangle, a square and a parallelogram. The circumference of the triangle is 9, the circumference of the square is 8 and the circumference of the parallelogram is 10. What is the circumference of the entire figure?
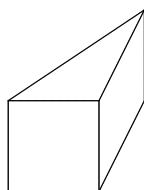
a) 11   **b)** 12   **c)** 13   **d)** 14   **e)** 15

12. How many two-digit numbers are there in which the tens digit is larger than the units digit?

a) 10   **b)** 30   **c)** 45   **d)** 50   **e)** 55

13. The long side of a rectangular fence is three times as long as the short side. The area surrounded by the fence is $75\,\text{m}^2$. Compute the circumference of the fence (i.e. the total length of the fence).

a) $32\,\text{m}$ **b)** $40\,\text{m}$ **c)** $42\,\text{m}$ **d)** $45\,\text{m}$ **e)** $50\,\text{m}$

14. To celebrate her 14th birthday Charlene lists all those numbers that have at most four digits, and have 1 and 4 as two consecutive digits in that order. How many numbers are on her list when it is complete?

a) 100   **b)** 199   **c)** 200   **d)** 299   **e)** something else

15. How many of the numbers 1, 2, $\ldots$, 999 are divisible by one of the numbers 7 and 11 but not by both of them?

a) 90   **b)** 142   **c)** 220   **d)** 232   **e)** something else