Mathematics competition for 7th graders in Turku region, March 2-6, 2020

- The duration of the competition is 50 minutes.
- Allowed tools: pen/pencil, eraser, compass, ruler, extra paper. No calculators or books of tables are allowed.
- There are 15 multiple choice questions. Each question has a single correct answer. You get one point for a correct answer. No points are deducted for wrong answers.
- The problems have not been sorted according to their difficulty, but the earlier ones tend to be easier.

1. Calculate $73.5 - 22.25$.

a) -149 **b)** 51.25 **c)** 512.5 **d)** 5125 **e)** 93.75

2. Which of the following numbers is seventeen million five hundred thousand forty-nine?

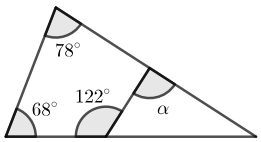
a) 1 750 049 **b)** 17 050 049 **c)** 17 500 049 **d)** 170 500 049 **e)** 175 000 049

3. A pizza has been divided into several slices of equal size. Nina eats one sixth of the slices, Verneri eats one quarter of the slices, and Maija eats one half of them. A single slice is left over. How many slices were there altogether?

a) 12 **b)** 13 **c)** 18 **d)** 24 **e)** 36

4. Determine the angle α (in degrees).

a) 66° **b)** 77° **c)** 88° **d)** 99° **e)** 111°



5. It is known that the product of ten positive integers is equal to 100. How large can the largest factor be?

a) 0 **b)** 1 **c)** 1.59 **d)** 100 **e)** The largest factor can be as large as we want.

6. A bag contains marbles that are either green, blue or red: 12 are green, 20 blue, and 13 red. We pull marbles out of the bag randomly. How many marbles do we need to pick to be sure that we have at least two of each color?

a) 6 **b)** 27 **c)** 34 **d)** 35 **e)** 45

7. The vertices of a triangle are at the points $(1, 2)$, $(4, 5)$ ja $(4, 7)$. What can we say about this triangle?

a) It is equilateral.
b) It is isosceles.
c) It is right-angled.
d) It is obtuse.
e) More than one of the above claims is true.

8. We have three baskets. Between them, the red and blue baskets contain a total of 13 balls, whereas the blue and yellow baskets contain 15 balls, and the yellow and red baskets contain 7 balls. How many balls are there in the red basket?

a) 0 **b)** 2 **c)** 4 **d)** The described situation is impossible.
e) The given information leaves many possible alternatives.

9. A rectangular parallelopiped has exactly n edges of length one unit. A possible value of n is?

a) 2 **b)** 4 **c)** 9 **d)** 11 **e)** All of the above.

10. Which is the largest among the following fractions?

$$A = \frac{15}{31}, \quad B = \frac{16}{33}, \quad C = \frac{17}{35}, \quad D = \frac{18}{37}$$

a) A **b)** B **c)** C **d)** D **e)** All the fractions are equal.

11. The average math grade of all the students in a class is exactly 8.24. The number of students in the class is at least

a) 32 **b)** 24 **c)** 30 **d)** 25 **e)** 20?

12. Calculate $\left|-\left(-\left(-\left(0-4\cdot 1\cdot 5\cdot \frac{1}{3}\cdot 3\cdot \frac{1}{4}\cdot \frac{1}{5}\right)\right)\right)\right|$.

a) -1 **b)** 0 **c)** 1 **d)** $-\frac{4}{3}$ **e)** $\frac{4}{3}$

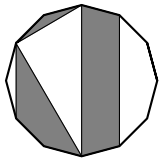
13. In her bookshelf a mathematician has books in four languages: Finnish, Swedish, French or English. She pulls a book off the shelf at random. We know that with probability $\frac{2}{5}$ the book is in either Finnish or Swedish, with probability $\frac{4}{5}$ in one of Swedish, French or English, and with probability $\frac{1}{2}$ it is in English. What fraction of her books are written in French?

a) $\frac{3}{10}$ **b)** $\frac{1}{5}$ **c)** $\frac{1}{2}$ **d)** $\frac{1}{10}$ **e)** $\frac{3}{20}$

14. For a positive integer a we denote by $a!$ the product of the numbers 1, 2, ..., a. So for example $1! = 1$ and $5! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5$. Given that a and b are positive integers, which of the following digits **cannot** be the least significant digit (=the last digit) of $a! + b!$?

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

15. The figure below shows a regular 12-gon. We are given that the total area of the 12-gon is 1. What is the area of the shaded region?



a) $\frac{7}{11}$ **b)** $\frac{1}{4}$ **c)** $\frac{1}{3}$ **d)** $\frac{5}{12}$ **e)** $\frac{1}{2}$