MATHEMATICS COMPETITION FOR THE SEVENTH GRADERS OF OULU SUB-REGION, 17–21 FEBRUARY 2020

- 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 has one correct answer. Wrong answers do not reduce points.
- The problems are not ordered by increasing difficulty, but the first problems are likely to be easier than the last ones.

1. Compute $100 - (30 - 5) - 25$.

a) 40   **b)** 50   **c)** 65   **d)** 90   **e)** 100

2. Compute $1 - 20 + 2 - 19 + 3 - 18 + \ldots + 19 - 2 + 20 - 1$.

a) -15 **b)** -1 **c)** 0   **d)** 15   **e)** 420

3. Integers are picked randomly between 1 and 20. At least how many numbers must be picked so that at least one of the picked numbers is divisible by three?

a) 3   **b)** 6   **c)** 10   **d)** 15   **e)** 20

4. The recipe of a pie includes 200g of sour cream and 3dl of berries. One gets 12 slices from one pie. A football club organizes a fair and they try to make as many pies as possible for sale. They have in their use 2,4kg of sour cream and 10 litres of berries. How many slices of pie can they make for sale at most? (Take into account that if they run out of either sour cream or berries they have to stop baking.)

a) 144   **b)** 100   **c)** 12   **d)** 360   **e)** 400.

5. Which of the following numbers is the sum of four consecutive positive integers?

a) 20   **b)** 21   **c)** 22   **d)** 23   **e)** 24

6. If $a \star b = a \cdot b + 3$ what is $3 \star 4$?

a) 7   **b)** 10   **c)** 12   **d)** 15   **e)** 21

7. There are 12 balls in the blue basket and the red basket together, 15 balls in the blue basket and the yellow basket together and 7 balls in the yellow basket and the red basket together. How many balls are there in the red basket?
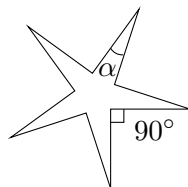
a) 0   **b)** 2   **c)** 4   **d)** 5   **e)** The problem cannot be solved with the given information.

8. How many positive integers m satisfy the inequality

$$m \cdot (7 - m) > 0?$$

a) 0   **b)** 6   **c)** 7   **d)** 8   **e)** infinitely many.

9. How large is angle α when all the points of the star are the same size and all the angles between the points of the star are 90°?

a) 9°   **b)** 18°   **c)** 27°   **d)** 36°   **e)** 72°

10. A regular pentagon is divided into two parts by a line. Which of the following cases is NOT a possible combination for the shapes of the two parts?

a) Two quadrangles   **b)** Two pentagons   **c)** A triangle and a quadrangle
d) A triangle and a pentagon   **e)** A quadrangle and a pentagon

11. A sequence consists of 2020 numbers each of which is either 1 or -1. The same number may appear in the sequence at most three times in a row. What is the biggest possible value of the sum of all the numbers in the sequence?

a) 0   **b)** 505   **c)** 1010   **d)** 1515   **e)** 2020

12. Joonas and Jussi both have 100 euros of cash. On the first day Joonas deposits one tenth of his cash into his bank account while Jussi withdraws the amount corresponding to one tenth of his cash from his own bank account. On the second day Jussi deposits one tenth of his cash into his bank account while Joonas withdraws the amount corresponding to one tenth of his cash from his own bank account. Which one has more cash by the end of the second day?

a) Jussi   **b)** Joonas   **c)** They both have the same amount of cash   **d)** The answer depends on the amount of money on Jussi's account   **e)** The answer depends on the amount of money on Joonas's account
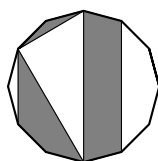
13. How many different 4-letter words can you get from letters A, B, C, A? (The words don't have to mean anything.)

a) 6   **b)** 12   **c)** 18   **d)** 24   **e)** 30.

14. Two frogs, Samu ja Panu, will leap across a track of 60 cm. All of Panu's leaps are of equal length. Samu's first leap is 2 cm and the following leaps are always as long as the distance Samu has covered so far. How long must Panu's leaps be at least so that both frogs get to the end of the track with the same amount of leaps?

a) 5 cm   **b)** 8 cm   **c)** 10 cm   **d)** 15 cm   **e)** 20 cm

15. Below is a picture of a regular 12-gon. If the area of the 12-gon equals to 1, what is the area of the gray part?

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