

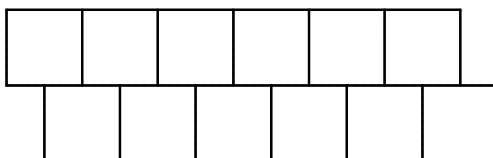
MATHEMATICS COMPETITION FOR THE SEVENTH
GRADERS OF HELSINKI, 29 FEBRUARY – 4 MARCH, 2016

- 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 $1379 + 2480 - 3576$.

- a) 283 b) 289 c) 353 d) 495 e) 603

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) 30

3. A fish weighs 2 kg plus a third of its own weight. How many kilograms does the fish weigh?

- a) $\frac{7}{3}$ kg b) $\frac{8}{3}$ kg c) 3 kg d) 3,5 kg e) 4 kg

4. Which of the following statements is true? The number 2016 is divisible by the numbers

- a) 2, 6 and 11 b) 3, 5 and 12 c) 4, 9 and 14 d) 2, 7 and 13 e) None of the previous ones.

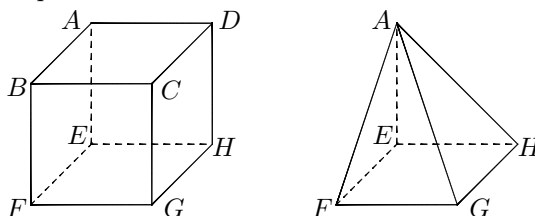
5. The sum of two unknown numbers is 24 and their difference is 2. What is their product?

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

6. 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

7. The left-hand figure depicts a cube $ABCDEFGH$ and the right-hand figure depicts the pyramid $A EFGH$. How large a portion of the volume of the cube is inside the pyramid?



- a) $\frac{3}{4}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$ e) $\frac{1}{4}$

8. Aino and Oona take part in an exam. Aino can solve each problem in 4 minutes and Oona in just 1 minute. Oona takes a one hour nap in the middle of the exam. Aino and Oona finish the exam at exactly the same time. How many problems were there in the exam?

- a) 16 b) 17 c) 18 d) 19 e) 20

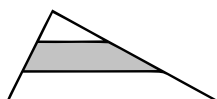
9. A basket contains ten red apples and ten green apples. The green apples are all identical, and similarly the red apples are all identical. A and B divide the apples between themselves according to the following rules:

- Each gets at least one red and at least one green apple.
- A gets more red apples than B.
- B gets more green apples than A.
- There are no more apples in the basket once A and B are finished.

In how many ways can A and B divide the apples?

- a) 1 b) 4 c) 12 d) 16 e) 25

10. In the following figure the horizontal lines divide each of two sides of the triangle into three equal parts. How large a portion of the figure has been colored?

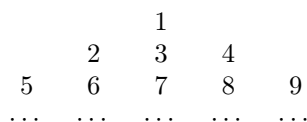


- a) $\frac{3}{4}$ b) $\frac{3}{5}$ c) $\frac{5}{9}$ d) $\frac{4}{9}$ e) $\frac{1}{3}$

11. We know that one large weight weighs more than two small weights. We also know that seven small weights weigh more than two large weights. Furthermore, we know that one of the following statements is true. Which one?

- a) Three large weights weigh as much as one small weight.
- b) Three large weights weigh as much as 12 small weights.
- c) One large weight weighs as much as three small weights.
- d) Three large weights weigh as much as six small weights.
- e) One large and one small weight weigh as much as two small and one large.

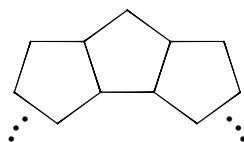
12. On the first row, we write only the number 1. On the second row, we write the numbers 2, 3 and 4 so that the middle number 3 is right under 1. Similarly, on the third row, we write the numbers 5, 6, 7, 8 and 9 so that the middle number 7 is under 1 and 3. By continuing in this way, we get a figure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



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

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

13. We have tiles of the shape of a regular pentagon and we place them into a ring as follows:



How many tiles are there in the ring?

- a) 8 b) 9 c) 10 d) 12 e) 15

14. How many four-digit numbers (that is, integers from the interval 1000–9999) are there in which the sum of the digits is even?

- a) 2250 b) 4499 c) 4500 d) 5000 e) 5001

15. Compute the quotient

$$\frac{1^4 + 100^4 + 101^4}{1^2 + 100^2 + 101^2}$$

- a) 5050 b) 5051 c) 10001 d) 10101 e) 20202.