

MATHEMATICS COMPETITION FOR THE SEVENTH  
GRADERS OF OULU SUB-REGION, 19–23 FEBRUARY 2018

- 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 subtract points.
- The problems are not ordered by increasing difficulty, but the first problems are likely to be easier than the last ones.

1. Compute  $71 - 28$ .

- a) 14    b) 25    c) 34    d) 43    e) 53

2. Compute  $(10 - 1)(10 + 1)$ .

- a) 10    b) 20    c) 49    d) 99    e) 100

3. Compute  $1 \cdot (-2) \cdot 3 \cdot (-4) \cdot \dots \cdot 9 \cdot (-10)$ .

- a) 0    b) 1374865    c) -1374862    d) 3628800    e) -3628800

4. Let us define a new operation  $\star$ :

$$a \star b = a + 2b.$$

What is  $5 \star 3$ ?

- a) 0    b) 3    c) 5    d) 8    e) 11

5. A square lies on the plane so that three of its vertices lie at the points with the coordinates  $(0, 0)$ ,  $(1, 0)$  and  $(1, 1)$ . Where lies its fourth vertex?

- a)  $(0, 1)$     b)  $(0, -1)$     c)  $(-1, 0)$     d)  $(-1, -1)$     e) None of the previous.

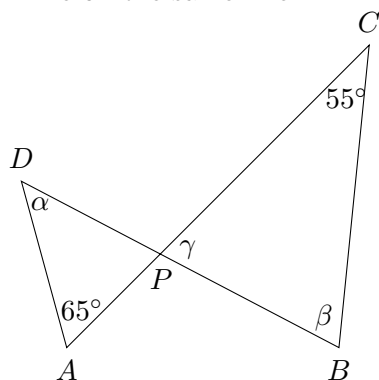
6. A mathematician bikes from her home to the library at the speed of 15 km/h and the trip takes 20 minutes. She bikes back home from the library the same way at the speed of 12 km/h. How long does the return trip take?

- a) 16 min    b) 19 min    c) 22 min    d) 25 min    e) 28 min

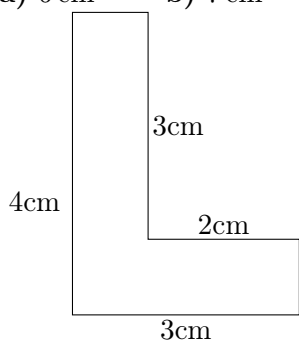
7. A tower is built using red, blue and yellow cubical building blocks. The finished tower consists of 5 blocks and its height is 5 blocks. Each color is required to appear in the tower. Only yellow blocks are allowed above yellow blocks, and only blue blocks are allowed below blue blocks. How many towers satisfying these conditions are there?

- a) 0    b) 1    c) 3    d) 6    e) 10

8. Compute  $\alpha + \beta + 2\gamma$ . The points  $A, P$  and  $C$  lie on the same line, and the points  $D, P$  and  $B$  lie on the same line.



- a)  $60^\circ$     b)  $120^\circ$     c)  $180^\circ$     d)  $240^\circ$     e)  $300^\circ$
9. What is the area of the L-shaped figure below?
- a)  $6 \text{ cm}^2$     b)  $7 \text{ cm}^2$     c)  $12 \text{ cm}^2$     d)  $18 \text{ cm}^2$     e)  $35 \text{ cm}^2$



10. Four trays of muffins are baked and one tray means 16 muffins. The baked goods are frozen and need to be packed into bags. Each bag will contain either five or six muffins. What is the smallest number of bags needed to pack all the muffins according to these requirements?

- a) 11    b) 12    c) 13    d) 14    e) 15

11. Compute  $\lfloor (\sqrt{2} - 1)^2 \rfloor$ . (The notation  $\lfloor x \rfloor$  means the largest integer which is less than or equal to the number  $x$ .)

- a)  $-1$     b)  $0$     c)  $0.5$     d)  $1$     e)  $2$

12. 13 October 2017 was a Friday. When was/will be the next time a Friday is the 13th day of a month (since 13 October 2017)? (There are 31 days in each of January, March, May, July, August, October and December, 28 days in the February of 2018, every other month has 30 days.)

- a) in December 2017    b) in January 2018    c) in April 2018  
d) in July 2018    e) in October 2018

13. Let us consider the sum of 2018 odd integers. Some of the numbers may be equal to each other. Which of the following are possible values for the sum?

- a) 0, 10 and 100    b) 0, 55 and 2018    c) 20, 2018 and 2019  
d) 2018, 2019 and 2020    e) None of the previous choices.

14. How many distinct real solutions does the equation  $(x^{2018} + 1)(3x^{2018} + 3) = 3$  have? (The notation  $x^{2018}$  means the number  $x \cdot x \cdot \dots \cdot x$ , where  $x$  appears 2018 times.)

- a) 0    b) 1    c) 2    d) 2018    e) 4036