

38th CHAMPIONSHIP, 2024: MATHEMATICAL AND LOGIC GAMES

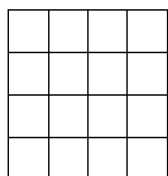
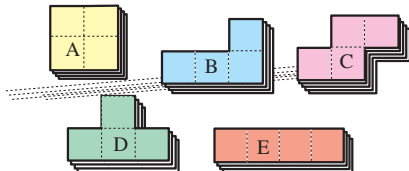
FSJM Quarter final

Information and results at <http://www.fsjm.ch/>

START FOR ALL PARTICIPANTS

1. Tetraminoes (coefficient 1)

Matilda found these puzzle pieces, four of each shape.



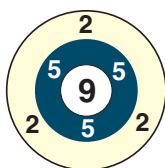
By using four identical pieces, she wants to completely cover the squares of this grid.

For what shape will this not be possible?

2. Darts (coefficient 2)

By throwing darts at this target, Matthew scored 24 points.

How many darts did he throw, at least?



3. Library (coefficient 3)

In this library, there are only collections of mathematical games, all of which have a blue cover, and novels. Novels of over 100 pages all have a white cover.

Which of these books definitely cannot come from this library?

1. a yellow book;
2. an 85-page green book;
3. an orange book of 120 pages;
4. a red book.

Write the number of that book.

4. Sweets (coefficient 4)

Alice, Bernard, Chloe and Damian each have at least one sweet. Between them, they have a total of 24.

Bernard has twice as many as Damian and Alice has six times as many as Chloe.

How many does Alice have?

5. An Easy Division (coefficient 5)

Divide this figure into four superposable parts and write the numbers of all the boxes which belong to the same part as box no. 24.

1	2	3		
4	5	6	7	8
9	10	11	12	
13	14	15	16	
		17	18	19
20	21	22	23	24

The cuts must follow the grid lines and the superposition can be done with or without rotating or flipping the pieces. Write the numbers of the boxes in order, from smallest to largest (24).

END FOR CE PARTICIPANTS

6. Snail (coefficient 6)

A snail fell to the bottom of a 24 metre deep well. It takes him an hour to climb 3 metre, then, tired, he slides down for an hour and goes back 2 metre.

He begins his ascent on a Sunday at noon.

What day of the week and what time will he reach the top of the well?

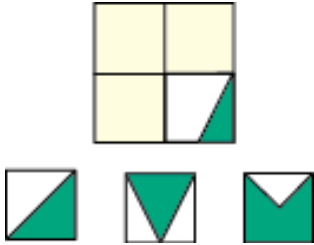
7. Matilda's Piggybank (coef. 7)

Matilda has just broken her piggybank. It contained 24 coins. She arranges her coins in piles of the same value: from left to right and in this order, a single one-franc coin, then a pile of 50 centime coins, a pile of 20 centime coins and a pile of 10 centime coins, each pile containing more coins than the one to its left.

How much money does Mathilde have, at most?

8. Four Squares (coefficient 8)

Matilda found four little squares. She wants to glue them onto a larger square and has already glued one of them. She's going to glue the other three onto the yellow squares, then cut out and remove the green parts, but she wants the remaining white part to be in one piece.



How many different shapes can this white part have?

END FOR CM PARTICIPANTS

Problems 9 to 18: beware! For a problem to be completely solved, you must give both the number of solutions, AND give the solution if there is only one, or give any two correct solutions if there are more than one. For all problems that may have more than one solution, there is space for two answers on the answer sheet (but there may still be just one solution).

9. Two Calendars (coefficient 9)

Oddly, on an old 21st century calendar, from Friday March 1 and only from that day, but then until the end of the year, the days of the week indicated coincide with those of the 2024 calendar. For example, March 2 is a Saturday on both calendars (the old one and that of 2024), March 3 is a Sunday on both calendars, etc.

For which year is this old calendar?

10. Mathematical Hen (coefficient 10)

A hen can count. We put her in front of a pile of 2024 eggs. She is very organized: she starts a second pile in which she places the eggs as she counts them. But each time she has counted 4 eggs, she lays an egg which she places in the pile of eggs that remains to be counted.

When there is only one pile left, how many eggs will she have counted?

11. Funny Calculation (coefficient 11)

Matthew divided a 4-digit number by a 2-digit number. In this calculation, the letter A and the letter B each replace a non-zero digit and $A \neq B$.

$$\frac{ABBA}{BB} = \text{BB}B$$

Mathias's calculation is correct, but he has made two ink stains which hide two digits of the result.

What number does ABBA represent?

END FOR C1 PARTICIPANTS

12. Trapezia of the Year (coef. 12)

How many isosceles trapezia (uncrossed and unflattened) are there?

- whose sides all measure whole numbers of cm;
 - and whose perimeter measures 24 cm?
- Please note, a rectangle and a square are examples of isosceles trapezoids.

13. Let's Optimize... (coefficient 13)

The positive integers x, y, z are such that:

$$(2024 - x)(2024 - y)(2024 - z) = 6.$$

What is the greatest value of the sum $(x + y + z)$?

14. A Luminous Equality (coef. 14)

In this cryptarithm, the same letter always replaces the same digit, two different letters always replace two different digits and the first digit of a multi-digit number can never be 0.

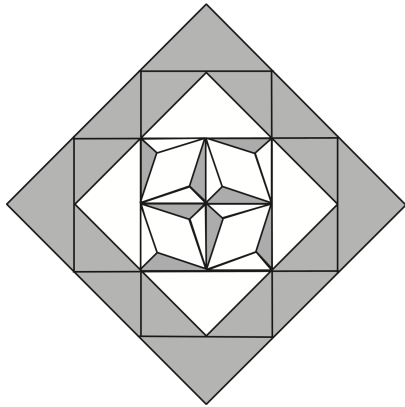
If $UN \times UN = NEON$, how much is ONE?

END FOR C2 PARTICIPANTS

15. Mosaic (coefficient 15)

The perimeter of this mosaic is made up of isosceles right triangles.

The four white quadrilaterals in the centre are diamonds with the small diagonal measuring exactly half the length of the long diagonal.



What is the proportion of the white surface in relation to the total surface of the large square?

Note: give the answer as an irreducible fraction.

16. Pyramid of Cubes (coefficient 16)

I have 2024 orange cubes and 2024 green cubes.

I build a pyramid thus:-

at the very top: a single cube of one of the two colours; just below 4 cubes of the other colour arranged in a square; below a square of 9 cubes of the first colour; below a square of 16 cubes etc., systematically alternating colours.

All floors are complete; I used exactly the 2024 orange cubes.

How many green cubes do I have left?

END FOR L1, GP PARTICIPANTS

17. Marbles (coefficient 17)

Arthur and Barbara are playing a game. In a bag, there are between 2 and 24 marbles. Each is either blue or red. Two marbles are drawn at random. Arthur wins if they are the same colour, otherwise, Barbara wins.

How many marbles are there in the bag knowing that either has an equal chance of winning?

18. A Very Mysterious Number

(coefficient 18)

This four-digit number is equal to the product of the sum of its digits and the square of the sum of the squares of its digits.

What is this mysterious number?

END FOR L2, HC PARTICIPANTS