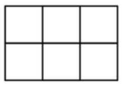
39th FFJM CHAMPIONSHIP - INTERNATIONAL FINAL – 23 AUG 2025

Information and results at http://www.ffjm.org/

START for ALL PARTICIPANTS

1. ANTHONY'S FRIENDS (coefficient 1)
Antoine has many friends. 15 of his friends like solving Sudoku puzzles, and 18 like decoding puzzles.
If we know that 3 of his friends like both types of games, how many friends does Anthony have who like games (Sudoku or decoding)?

2. NON-SQUARE RECTANGLES (coef 2)



In this figure, we can count eight squares: six small and two larger. But how many fully drawn rectangles can we count that are not squares?

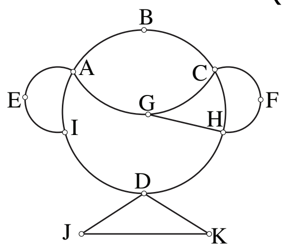
3. CODE (coefficient 3)
Zoe chooses a four-digit unlock code for her phone, with the following properties:

- The sum of the four digits is 25;
- The first digit is 1;
- Three of the digits are consecutive (in succession);
- The four digits are written in ascending order (from smallest to largest).

What code does Zoe choose?

4. TASTY COLOURS (coefficient 4)
Magda made a candy bracelet for her sister. There were 15 candies of three different colours, with an equal number of candies of each colour. On this bracelet, no two neighbouring candies were ever the same colour.
When she got home, Magda ate all the red candies and at least one other one.
What is the greatest number of candies that can remain on the bracelet if two neighbouring candies are still always different colours?

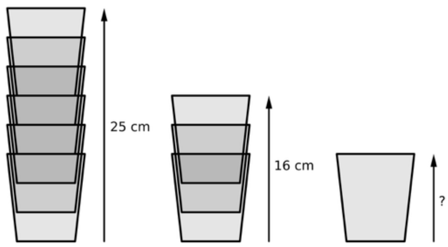
5. BUS ROUTE (coefficient 5)



On this map, a bus must use all the roads connecting the stops marked A to K, and it can pass the same stop multiple times.
From which stop should it depart if the bus must use all the roads exactly once? Provide all possible departure stops.

END for CE PARTICIPANTS

6. GLASSES (coefficient 6)



Six stacked glasses have a total height of 25 cm, while three stacked glasses measure only 16 cm.
What is the height in cm of a single glass?

7. TUNISIA (coef. 7)
Each letter of the word TUNISIA is replaced by one digit, and two different letters are always replaced by different digits.
We know that:

- I is replaced by 1;
- there is only one odd digit other than 1;
- two odd numbers are not written side by side;
- the sum of the digits is 25.

What is the highest possible value for the word TUNISIA?

8. LUCKY SQUARE (coefficient 8)

14	2	5	8
13	12	9	4
10	7	15	20
1	16	19	17

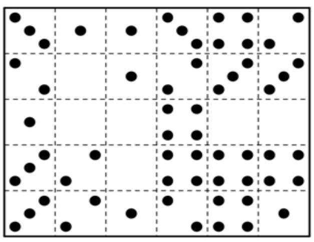
A 4×4 square is filled with different numbers. The square is “lucky” if the numbers are arranged in ascending order:
• from left to right in each row;
• from top to bottom in each column.
Two numbers can be swapped if they are:
• adjacent (side by side, horizontally or vertically);
• or opposite (first and last squares in the same row or column).
What is the smallest number of swaps required for the square to become lucky?

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).

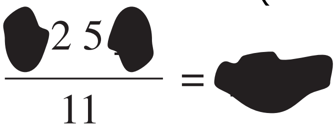
9. DOMINO BOX (coefficient 9)

Tom's domino set consists of 15 dominoes with spots ranging from double zero to double four. He put them in their box in the following arrangement:



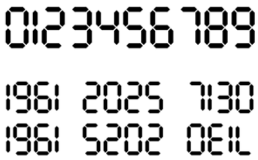
Trace the outline of all double dominoes (0-0; 1-1; 2-2; etc.).

10. STAINED! (coef. 10)



Matilda divided a 4-digit number by 11, but Matthew stained her notebook.
What is the result of the division, given that this result is exact and divisible by 3?

11. JANUS YEARS (coefficient 11)



When you write 1961 in 7-segment numerals on a piece of paper, no matter how you turn the paper, it will always read 1961. This is not the case for the number 2025, which can be read as 5202 if you look at it the wrong way, nor for 7130, which will be read as 0E1L *(EYE in English)*. Numbers such as 1961 that have the same appearance twice are called Janus numbers.
How many Janus years have there been from the year 1 (including the year 1) to 2025?
Note: a year never begins with zero.

END for C1 PARTICIPANTS

12. HIS TWO FAVOURITE NUMBERS (coefficient 12)
The product of Matthew's two favourite numbers is twice their sum and three times their positive difference.
Give the pair (a; b) where a < b.

13. CHEFISSIMA (coef. 13)
A talented lady chef has invented a new egg cooking method. She must cook it for exactly seven minutes. A customer in a hurry orders one. But the lady chef has forgotten her egg timer.
Luckily, in her cupboard, she finds three hourglass timers: of 6, 10, & 15 minutes.
How soon can she serve this customer a perfectly cooked egg?
Note: when she turns over an hourglass, she must let it empty completely.

14. CERTAIN NUMBERS (coefficient 14)

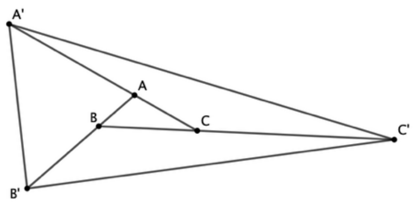
I am a decimal number greater than 1, and I can be written as an irreducible fraction a / b where ab = 12'600.

Find me!

Answer in the form of a decimal number: written in base 10 with a finite number (possibly zero) of digits after the decimal point.

END for C2 PARTICIPANTS

15. TRIANGLE COMPARISONS (coefficient 15)



Starting with triangle ABC, we construct triangle A'B'C' as follows:

- A' lies on half-line CA such that A'A = 2AC;
- B' lies on half-line AB such that B'B = 2BA;
- C' lies on half-line BC such that C'C = 2CB.

What is the ratio of the area of triangle A'B'C' to the area of triangle ABC?

Give the answer as an irreducible fraction.

16. INTEGER PYRAMIDS (coef. 16)

In the year 2025 BCE, the Pharaoh loved whole numbers. For his birthday, he received a collection of small triangular pyramids, each of whose six edges was a whole number of centimetres long. Furthermore, the product of these six numbers is always at most 2025, and the four faces are strictly acute triangles (the three angles are strictly less than 90°).

How many different pyramids does he receive at most?

Note: two pyramids are considered identical if they can be obtained from each other by rotation or symmetry.

END for L1, GP PARTICIPANTS

17. FRACTIONS THAT HAVE SOMETHING NEW (coef. 17)

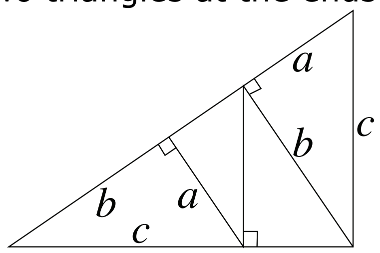
Matthew begins writing the fractions 3/2, 5/4, 17/16, where each denominator is the square of the previous denominator, and each numerator is one more than the denominator. He multiplies them together and finds the decimal 1.9921875, which is written with two 9s immediately after the decimal point. He then decides to continue writing his sequence of fractions and calculating the product of all the fractions he has written. He stops as soon as the decimal notation of the product has at least 2025 9s immediately after the decimal point.

How many fractions has he written in total?

If necessary, take the logarithm of 2 in base 10 as 0.301.

18. SIMILAR TRIANGLES (coef.18)

All triangles are right-angled and similar. The two triangles at the ends are equal.



Give the values of a and c rounded to the nearest metre, given that b is 100 m.

END for L2, HC PARTICIPANTS