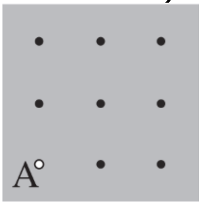
FSJM – SWISS FINAL- 17 MAY 2025

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

START for ALL PARTICIPANTS

1. Strings (coefficient 1)



On a board with nine nails placed as shown in the figure, Zoe wants to attach strings stretched between nail A and another nail on the board.

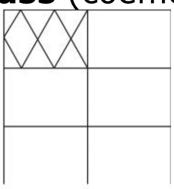
How many strings of different lengths can she place at most?

2. Dates (coefficient 2)

The date May 17, 2025, is written as 17/05/2025.

How many dates in the year 2025 can be written this way, using only the eight digits 0, 0, 0, 2, 2, 3, 4, 5?

3. Stained Glass (coefficient 3)



The stained-glass window in the figure is made up of six rectangles. Within each rectangle, there is a pattern based on identical diamond tiles. When the glazier cuts down a tile, (s)he can use all parts of that diamond in the stained-glass window.

How many diamond tiles did the glazier use to construct this stained-glass window?

4. It's Not Fair! (coefficient 4)

Ally, Bobby, and Charly are playing in the playground.

They have 87 marbles in total.

Charly has twice as many marbles as Bobby.

Ally has 7 more marbles than Bobby.

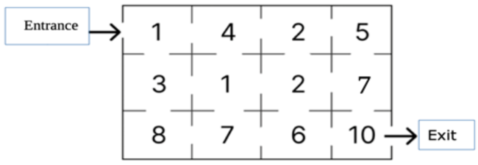
How many marbles does each child have?

5. Cursed Coins (coefficient 5)

Matthew explores a magical mansion where, in each room, he finds coins. The number of coins in each room is as shown in the figure.

He collects all the coins from the rooms he passes through, but these coins are cursed: when he is carrying an even number of coins, they disappear on leaving the room!

Matthew must not pass through each room more than once.



How many coins can Matthew carry with him, at most, when he leaves the mansion?

END for CE PARTICIPANTS

6. Rose's Rows (coefficient 6)

Rose plants flowers in rows in her garden. She starts with a single tulip in the first row, then two lilies in the second row, three crocuses in the third, four tulips in the fourth, and then adds one more flower to each row, alternating tulips, lilies, and crocuses, always in this order. She stops when she has planted her 25th and last tulip, without finishing the row.

How many flowers has Rose planted in total?

7. Dominoes (coefficient 7)
A domino is made up of two half-dominoes, each with has from 0 to 6 spots.
Examples: 
Matilda placed four different dominoes in a chain: two half-dominoes touching each other have the same number of spots.
She multiplied the number of spots on the eight half-dominoes and found 2025.
What is the total number of spots in the chain?

8. Max's Minimum Maximum (coef. 8)

Max divided these nine counters into three stacks of three counters. In each stack, he multiplied the numbers written on the counters and noted the largest of the three results, or one of the largest if two or more are equal.
What is the minimum value of this largest result?

END for CM PARTICIPANTS

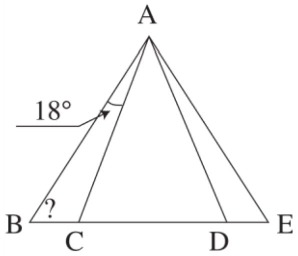
<u>Problems 9 to 18</u>: beware! For a problem to be completely solved, you must give both the number of solutions, and give the solution if there is only one, or give any two correct solutions if there are more than one. For all problems that may have more than one solution, there is space for two answers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

9. Number Sequence (coefficient 9)
A number sequence is made thus: a number is obtained from the previous one by writing in sequence the products of the digits taken 2 by 2: in the example below, after 41624, we obtain 46128 with the products $4 \times 1 = 4$, then $1 \times 6 = 6$, then $6 \times 2 = 12$, then $2 \times 4 = 8$.

.... ; ? ; 41624 ; 46128 ; ......

What is the number written in place of the question mark in this number sequence?

10. Framed (coefficient 10)

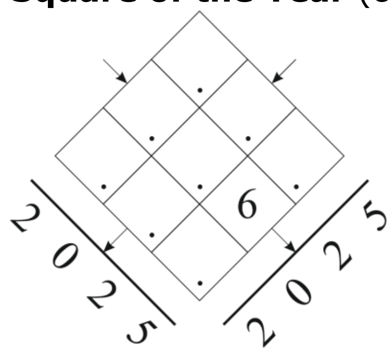


The figure represents a metal frame.
AB = AE = BD = CE.
Angle BÂC measures 18°.
What is the angle ABC in degrees?

11. A Special Year (coefficient 11)
The number 2025 is a multiple of the sum of its digits 2 + 0 + 2 + 5 = 9, and the quotient of 2025 and the sum of its digits 2025/9 = 225 is a perfect square.
Find another year in the 21st century with the same properties.
Note: The years of the 21st century are the years from 2001 to 2100 inclusive.

END for C1 PARTICIPANTS

12. The Square of the Year (coef. 12)



Place the numbers 1 to 9, except the 6 already in place, in the empty boxes of this square, so that by adding the three 3-digit numbers seen in each of the directions indicated by the arrows, we obtain 2025.

13. A New Sport (coefficient 13)
In this equation, each letter always replaces the same digit, and two different letters always replace two different digits.

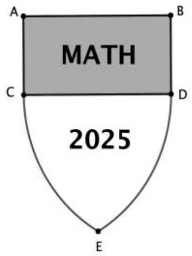
$$\frac{GOLF}{SKI} = 9$$

No letter replaces a 0 or a 9.
What is the value of GOLF, given that SKI is a multiple of 11?

14. The Years Pass, then Repeat (coefficient 14)
The number 23.24252525... where 25 is repeated infinitely, is the unlimited decimal expansion of an irreducible fraction.
Which fraction?

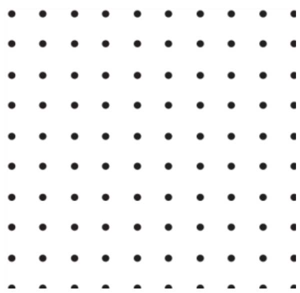
END for C2 PARTICIPANTS

15. Shield (coefficient 15)



For the 2025 maths competition, the organizers want to create a shield logo as shown. They give themselves the following constraints: AB = CD = 12 cm, and the two arcs of a circle have centres C and D.
What is the length AC, so that the area of the white surface is equal to that of the grey rectangle?
Give the answer in cm rounded to the nearest hundredth. If necessary, take √3 ≈ 1.732 and π ≈ 3.142.

16. Rhombi not Squares (coef. 16)
One hundred points are arranged regularly in squares as shown, so that any two neighbouring points horizontally or vertically are spaced one cm apart.



How many non-flattened, non-square rhombi can be drawn, having points on the figure as their vertices and whose sides are whole numbers of cm?

END for L1, GP PARTICIPANTS

17. Squaring the Square (coef. 17)
In how many different ways can a 5×5 square be completely tiled with squares of sides of integer length?
The entire large square must be covered, the small squares must not overlap, and two tilings are considered identical if one can be obtained with respect to the other by rotation and/or symmetry.

18. Matthew's Polygon (coef. 18)
On a sheet of paper, in an orthonormal coordinate system, Matthew placed the following four points with integer coordinates: O (0,0), P (2,0), Q (2,1) and R (1,2). He then drew a regular polygon passing exactly through these four points. Two of these points are on the same side of the polygon, and none of these points is a vertex of the polygon.
What is the side length of this polygon?

END for L2, HC PARTICIPANTS

The Swiss Federation of Mathematical Games warmly thanks its sponsors for their help in organizing this event

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