41st CHAMPIONSHIP: MATHEMATICAL AND LOGIC GAMES
FFJM Quarter final: categories C1 – C2

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

1.NON-CONSECUTIVE NEIGHBOURS

What is the smallest five-digit number with all distinct digits such that no two adjacent digits are consecutive (such as 1 and 2, or 7 and 8)?

The first digit of a five-digit number cannot be 0.

2. SUM OF THE DIGITS

The sum of the digits of a two-digit number is 6. If 18 is added to this two-digit number, the result is the same number with the digits reversed.

What is the number?

3. DIGITAL WATCH

My digital watch displays the time using two digits for the hours and two digits for the minutes. At 14:22, I notice that the product of the hour digits equals the product of the minute digits: $1 \times 4 = 2 \times 2$. This coincidence occurs again at 14:41: $1 \times 4 = 4 \times 1$.

How many times, including the two examples given, does such an equality occur between 14:00 and 17:00?

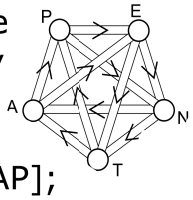
4. SIX TIMES UN

$$\begin{array}{r} UN \\ \times\ \ 6 \\ \hline =SIX \end{array}$$

In this multiplication, two different letters always replace two different digits, two different digits are always replaced by two different letters, and no multi-digit number begins with 0.

If we know that I = 1 and that all the letters represent digits strictly less than 6, what is the value of UN?

5. PENTA

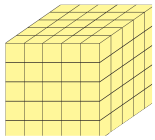


The city of Penta has five roundabouts designated by the letters P, E, N, T and A; five one-way outer streets [PE], [EN], [NT], [TA] and [AP]; and five one-way expressways [PN], [NA], [AE], [ET] and [TP].

In Penta, it is forbidden to travel along two outer boulevards in succession or two expressways in succession. Mathman sets off from P by car and wishes to travel along every road and return to P, all while complying with the regulations in force.

What route could he take?

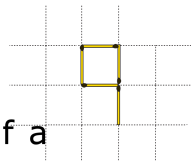
6. LARGE CUBE



A large cube with side length 5 cm is formed by assembling 125 small cubes with side length of 1 cm, all of which are painted green. The large cube is then painted yellow.

How many small cubes now have exactly 4 faces painted green?

7. ONE HUNDRED MATCHES



Matilda placed 100 matches along the grid lines of a square grid where each side length equals the length of a match.

What is the maximum number of grid squares that will be completely enclosed by 4 matches?

8. SIX POINTS

Six points are placed in the plane, and all triangles having three of these six points as vertices are drawn.

What is the maximum number of isosceles triangles that can be obtained in this way?

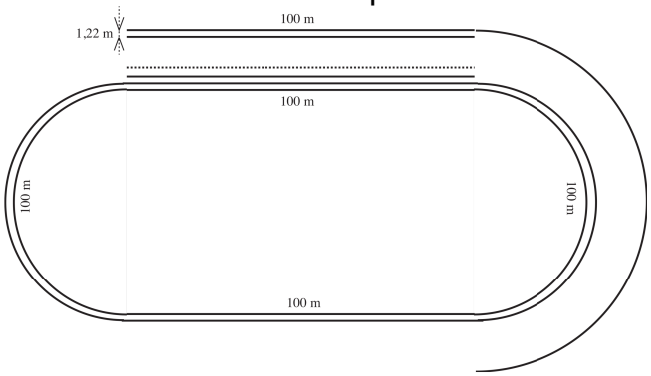
9. FOREST WALK

A rambler is walking through a forest at a speed of 3 km/h. Checking his watch, he realizes that if he continues at the same pace, he will arrive at the railway station exactly 3 minutes late. He then walks the rest of the way at 4 km/h, arriving exactly 4 minutes before the train.

How far was he from the station when he decided to change his pace?

10. ON YOUR MARKS…

In track athletics, races are run in eight adjacent lanes, each defined by parallel white lines spaced 1.22 m



apart.

A lane consists of two parallel straight segments connected by two semicircles.

Assume the length of each of these four sections is 100 m for the inner line of the first lane.

What is the length of the outer line of the eighth lane on an athletics track?

Use 3.14 for π and round to the nearest metre.