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*Indonesia International
Mathematics Competition 2022
(Virtual)*

Indonesia, 30th June to 6th July 2022

Elementary Mathematics International Contest

Team Contest

Time limit: 70 minutes

Information:

- You are allowed 70 minutes for this paper, consisting of 10 questions printed on separate sheets. For questions 1, 3, 5, 7 and 9, only numerical answers are required. For questions 2, 4, 6, 8 and 10, full solutions are required.
- Each question is worth 40 points. For odd-numbered questions, no partial credits are given. There are no penalties for incorrect answers, but you must not give more than the number of answers being asked for. For questions asking for several answers, full credit will only be given if all correct answers are found. For even-numbered questions, partial credits may be awarded.
- Diagrams shown may not be drawn to scale.

Instructions:

- Write down your team's name in the space provided on every question sheet.
- Enter your answers in the space provided after the individual questions on the question paper.
- During the first 10 minutes, the four team members examine the first 8 questions together, and altogether discuss them. Then they distribute the questions among themselves, with each team member is allotted at least 1 question.
- During the next 35 minutes, the four team members write down the solutions of their allotted problems on the respective question sheets, with no further communication / discussion among themselves.
- During the last 25 minutes, the four team members work together to write down the solutions of the last 2 questions on the respective questions sheets.
- It is forbidden to use instruments such as protractors, calculators and electronic devices.
- At the end of the contest, you must hand in the envelope containing all question sheets and all scratch papers.

English Version

Team: _____



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Team Contest

2nd July, 2022, Indonesia

Team : _____ Solver : _____ ID : _____

1. On New Year's Eve, a group of kids gathered together to play a simple math game. The first kid writes 2022 on a blackboard. The second kid and every kid thereafter replaces the number written by the previous kid with the product of the digits of that number plus 12. What number does the 59th kid write?

Answer: _____



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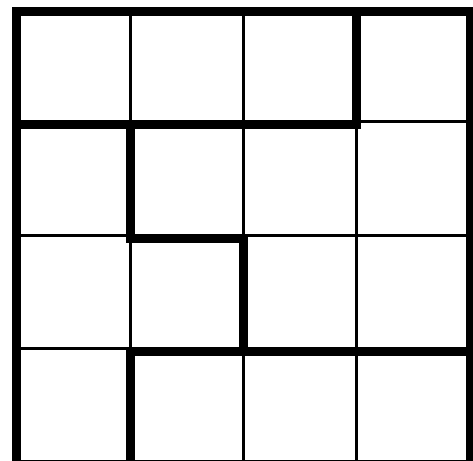
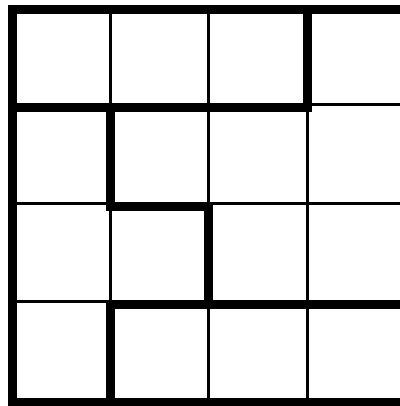
Team : _____ Solver : _____ ID : _____

2. In each cell in the grid below, write exactly one of the numbers 1, 2, 3, or 4 such that:

(a) In each row and column, the four written numbers are distinct;

(b) For each region highlighted in bold, either the sum or the product of the written numbers is equal to 12.

Explain your reasoning.



Answer: _____



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3. Fill up the infinite grid with the numbers 1, 2, 3, 4, 5, 6, 7, 1, 2, 3, 4, 5, 6, 7, 1, 2, 3, 4, 5, ... (numbers from 1 to 7, repeatedly) in a counterclockwise spiral-like manner starting at the shaded cell as shown in the diagram below. Which number is written in the cell that is located 2022 cells below the shaded cell?

	2	1	7	6	5	4	3	
	3	3	2	1	7	6	2	
	4	4	5	4	3	5	1	
	5	5	6	1	2	4	7	
	6	6	7	1	2	3	6	
	7	7	1	2	3	4	5	
	1	2	3	4	5	6	7	...

Answer: _____



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4. Select any positive integer n and write down the integers from 0 to n , inclusive, in some order with no spaces.
What is the minimum value of n for which the resulting string can have the same value when read forwards and backwards? What is the resulting string?

The minimum value of n is

One such resulting string is

Answer: _____



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5. A four-digit positive integer is called “good” if it consists of two pairs of same digits in some order but not all four digits are the same. For example, the numbers 2211, 2424 and 7007 are good, while 5555 and 3111 are not. Find the total number of “good” four-digit positive integers which are divisible by 7 or 101, but not divisible by both.

Answer: _____



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6. In a group of five people, the ages of four of them are known to be 21, 53, 19 and 60. It is known that the average of the five people is an odd number. If we arrange the ages of these five people in an increasing order, then the middle age is a multiple of 3. Find the sum of all possible values for the fifth age.

Answer: _____



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7. Five chess players, Andy, Boris, Clark, Dick and Eric played in a tournament, where every two participants played against each other exactly once. For each game, a player will get 2 points for a win, 1 point for a draw, and 0 point for a loss. At the end of the tournament, one noticed that: Boris drew all his games, Clark won exactly two games, Dick is ahead of Andy by 1 point, Eric is not in last place and he lost only to the only player who accumulated the lowest number of points. If their total scores are a, b, c, d, e , respectively, then what is the five-digit number \overline{abcde} ?

	Andy	Boris	Clark	Dick	Eric	Total
Andy						a
Boris						b
Clark						c
Dick						d
Eric						e

Answer: _____



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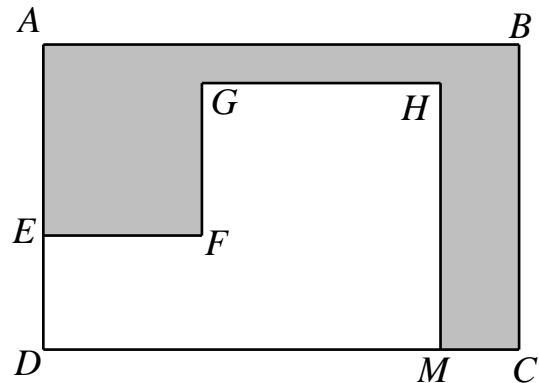
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8. A rectangular sheet of paper is cut into two pieces as shown in the diagram below, where one region is shaded. The eight sides of the shaded region have lengths of 1 cm, 2 cm, 3 cm, 4 cm, 5 cm, 6 cm, 7 cm and 8 cm, in some order. What are the maximum and the minimum possible areas, in cm^2 , of the unshaded region?



The maximum possible area of the unshaded region is _____ cm^2

Answer: The minimum possible area of the unshaded region is _____ cm^2

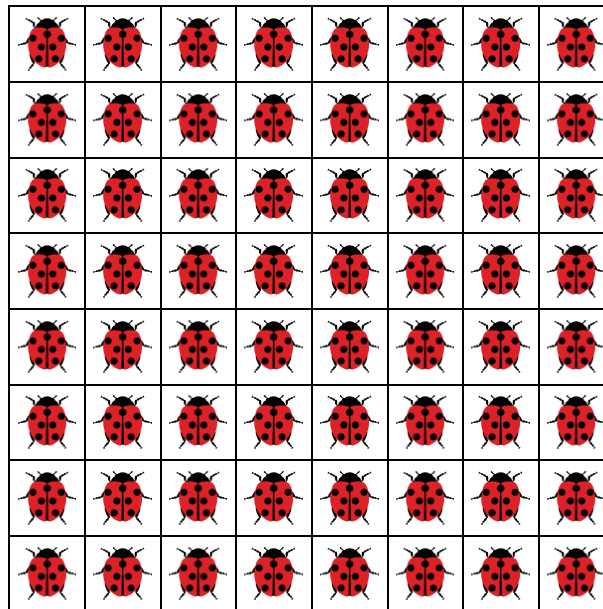
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9. In a 8×8 board, each cell has a bug. After a bell rings, all bugs jump to an adjacent cell in the same row or in the same column, and do not jump out of the board. Each cell can be empty, or contain more than one bug. What is the maximum number of empty cells after the bell rings?



Answer: _____ cells



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- 10.** We arrange the following seven 4-digit numbers: 2021, 2022, 2023, 2024, 2025, 2026 and 2027 in a row, in such a way that any two adjacent numbers are relatively prime. For example: 2027, 2022, 2023, 2024, 2025, 2026, 2021 is one such arrangement.

How many different such arrangements are there?

Answer: _____ arrangements