The Georg Mohr Contest 2023
Second Round

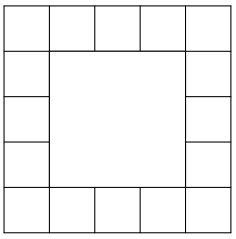
Tuesday, 10 January 2023 at 9–13

Aids permitted: only writing and drawing tools.
Remember that your arguments are important in the assessment
and that points may also be awarded to partial answers.

Problem 1. A frog jumps around on the integers on the number line. If it lands on an even number n, it jumps to the number $\frac{n}{2}$. If it lands on an odd number n, it jumps to the number $n+5$. At some point it lands on the number 25.

At which numbers may it have been three jumps ago?

Problem 2. The numbers $1, 2, 3, \ldots, 16$ must be placed in the 16 squares in such a way that the sum of the numbers in each of the four rows and columns is the same.



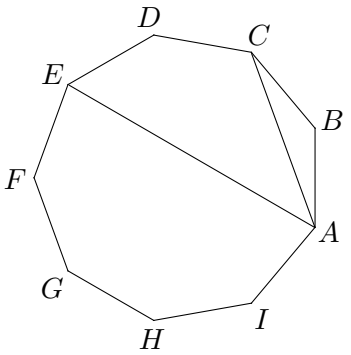
What is the smallest possible sum of the four numbers in the corner squares?

Problem 3. In a field, 2023 friends are standing in such a way that all distances between them are distinct. Each of them fires a water pistol at the friend that stands closest.

Prove that at least one person does not get wet.

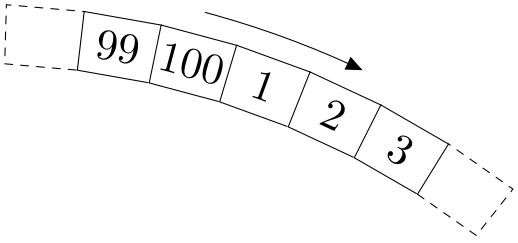
Problem 4. In the 9-gon $ABCDEFGHI$, all sides have equal lengths and all angles are equal.

Prove that $|AB| + |AC| = |AE|$.



Problem 5. Georg has a circular game board with 100 squares labelled $1, 2, \ldots, 100$. Georg chooses three numbers a, b, c among the numbers $1, 2, \ldots, 99$. The numbers need not be distinct. Initially there is a piece on the square labelled 100. First, Georg moves the piece a squares forward 33 times and puts a caramel on each of the squares the piece lands on. Then he moves the piece b squares forward 33 times and puts a caramel on each of the squares the piece lands on. Finally, he moves the piece c squares forward 33 times and puts a caramel on each of the squares the piece lands on. Thus he puts a total of 99 caramels on the board. Georg wins all the caramels on square number 1.

How many caramels can Georg win, at most?



Sponsors: Undervisningsministeriet, Novo Nordisk Fonden, Jobindex, Georg Mohr Fonden, Matematiklærerforeningen, Institut for Matematiske Fag KU, Institut for Matematik AU, Institut for Matematik og Datalogi SDU, Institut for Matematiske Fag AAU.