

The Georg Mohr Contest 2015
Second Round

Tuesday, January 6th, 2015 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. The numbers a, b, c, d og e satisfy

$$a + b < c + d < e + a < b + c < d + e.$$

Which of the numbers is the smallest, and which is the largest?

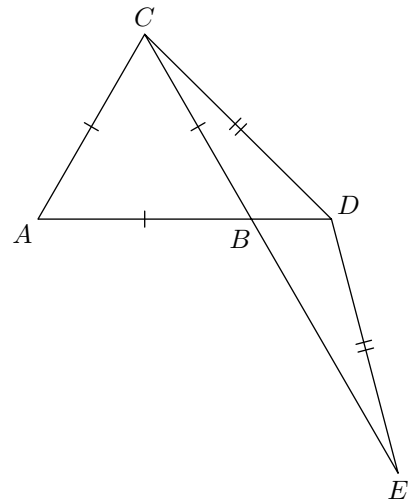
Problem 2. The numbers $1, 2, 3, \dots, 624$ are paired in such a way that the sum of the two numbers in each pair is 625. For example 1 and 624 form a pair, and 30 and 595 form a pair.

In how many of the 312 pairs does the smaller number evenly divide the larger?

Problem 3.

Triangle ABC is equilateral. The point D lies on the continuation of AB beyond B , the point E lies on the continuation of CB beyond B , and $|CD| = |DE|$.

Prove that $|AD| = |BE|$.



Problem 4. Determine all numbers x, y and z satisfying the system of equations

$$x^2 + yz = 1$$

$$y^2 - xz = 0$$

$$z^2 + xy = 1.$$

Problem 5. For which numbers n is it possible to put marks on a stick such that all distances 1 cm, 2 cm, \dots , n cm each appear exactly once as the distance between two of the marks, and no other distance appears as such a distance?

Sponsors: Undervisningsministeriet, Carlsbergs Mindelegat for Brygger J.C. Jacobsen, Georg Mohr Fonden, Matematiklærerforeningen, Dansk Matematisk Forening, Gyldendal and Aarhus Universitetsforlag.