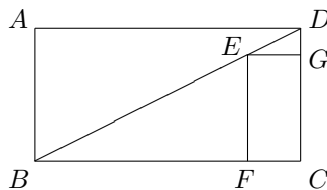


# The Georg Mohr Contest 2004

Thursday 8 January 2004 at 9-13h

Tools for writing and drawing are the only ones allowed

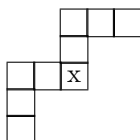
**Problem 1.** The width of rectangle  $ABCD$  is twice its height, and the height of rectangle  $EFCG$  is twice its width. The point  $E$  lies on the diagonal  $BD$ . Which fraction of the area of the big rectangle is that of the small one?



**Problem 2.** Show that if  $a$  and  $b$  are integers and  $a^2 + b^2 + 9ab$  is divisible by 11 then  $a^2 - b^2$  is divisible by 11.

**Problem 3.** The integers from 1 to 9 are placed in the figure shown below with one integer in each square. The sum of the three integers placed in the same horizontal or vertical line is 13.

Show that the integer at the marked place is 4.



**Problem 4.** Find all sets  $(x, y, z)$  of real numbers which satisfy

$$\begin{aligned}x^3 - y^2 &= z^2 - x \\y^3 - z^2 &= x^2 - y \\z^3 - x^2 &= y^2 - z\end{aligned}$$

**Problem 5.** Find all positive integers  $n$  such that a  $2n \times 2n$ -chessboard can be covered by non-overlapping L-pieces. An L-piece covers 4 squares and looks like the letter L. The L-piece may be rotated and reflected as required.



*Sponsors: Georg Mohr Fonden, Dansk Matematisk Forening, Matematiklærerforeningen, UNI-C and Gyldendal.*