SPECIAL MATHS CONTEST 2nd ROUND

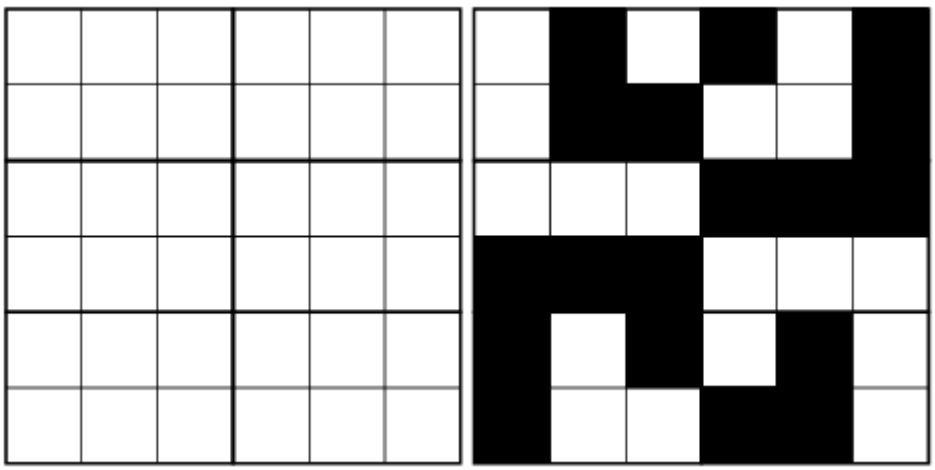
Saturday, 28th February 2026

Duration: 4 hours

Problem 1: Let $a_1, a_2, a_3, \ldots$, be an infinite sequence of integers such that $a_{n+1} = a_n + 2n$, for all $n \in \mathbb{N}$. Show that a_n is not a prime number for some $n \in \mathbb{N}$.

Problem 2: Let $ABCD$ be a quadrilateral with diagonals of equal lengths intersecting at E. Suppose the perpendicular bisectors of AB and CD intersect at F, and the perpendicular bisectors of BC and DA intersect at G. Show that EF is perpendicular to EG.

Problem 3: Given a 6×6 grid, we partition it into 6 grids of 2×3 each by stacking them 2 times horizontally and 3 times vertically. A colouring is called *Special Sudoku* if each unit square is coloured white or black such that each colour appears exactly 3 times in each row, column, and in each of the smaller 2×3 grids. How many such colourings are there? [The figure below is an example of such a colouring]



Problem 4: Find all functions $f: \mathbb{N} \longrightarrow \mathbb{N}$ satisfying $f\big(f(x)\big) + f(x) = 6x$, $\forall x \in \mathbb{N}$.