Series 4

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Problem C4. Find all nonempty sets S of integers with the following property: If $m, n \in S$, then $3m - 2n \in S$.

Problem N4. Find all positive integers n satisfying $2n + 7 \mid n! - 1$.

Problem G4. Denote by O the circumcenter of triangle ABC. The nine-point circle of triangle ABC meets the circumcircle of triangle OBC at K and L. Prove that $\angle BAL = \angle CAK$.

Problem A4. Let $P(x)$ be a polynomial with real coefficients such that there are infinitely many pairs of integers a, b satisfying $P(a) + P(b) = 0$. Prove that the graph of the function $y = P(x)$ has a center of symmetry.