Problemen

Problem Section

Problem A (proposed by Simone Di Marino)

Let P and Q be distinct points in the plane. Let $n \geq 2$. Assume n distinct lines through P but not through Q are given, as well as n distinct lines through Q but not through P. Let T be a collection of $2n$ intersection points of these lines. Suppose that the (unoriented) angle between the lines RP and RQ is the same for all R in T. Show that T can be partitioned into subsets of at least three elements each, such that every subset consists of the vertices of a regular polygon.

Problem B (proposed by Apoloniusz Tyszka)

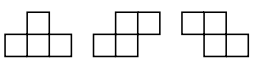
Show that there exist an $n \geq 1$, a polynomial $P \in \mathbf{Z}[X, Y_1, \ldots, Y_n]$ and an infinite set S of positive integers such that the set

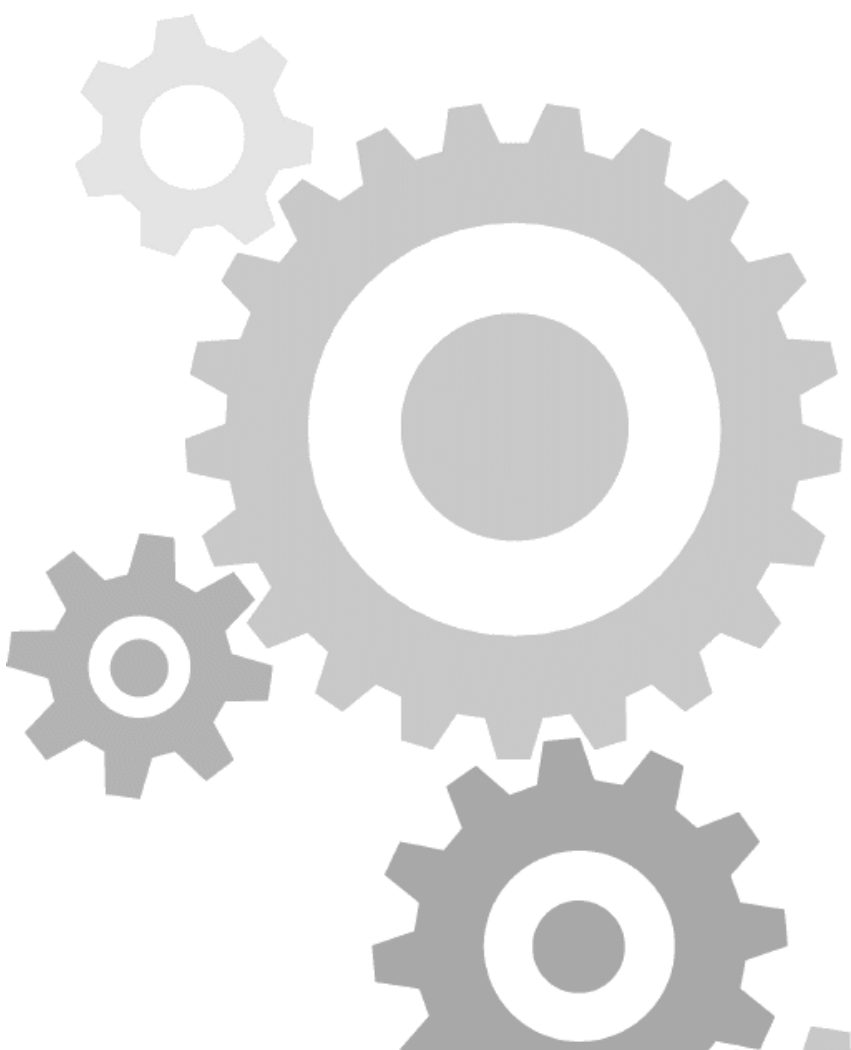
$$\left\{(y_1, \ldots, y_n) \in \mathbf{Z}^n : P(k, y_1, \ldots, y_n) = 0\right\}$$

is empty for all $k < 0$ and has precisely k elements for all $k \in S$.

Problem C (proposed by Gabriele Dalla Torre)

Is it possible to tile a 30 by 30 square grid using the following blocks?





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