A NEW VAN DER WAERDEN NUMBER

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A new Van der Waerden number, discovered recently, can now be added to the survey in [1]: \( W(2;3,6) = 109 \). There is one distinct string of length 108:

\[
S = 101101 \ 111110 \ 101101 \ 000111 \ 111001 \ 001111 \\
001110 \ 111110 \ 001011 \ 111101 \ 010010 \ 111101 \\
100110 \ 011011 \ 111001 \ 011101 \ 010011 \ 110111.
\]

An additional string is obtained by reversal. Runners-up are a palindrome of length 105 containing two ‘glue variables’ [1] which may be 0 or 1, and a string of length 104 which closely resembles the maximal string given above. These, and their substrings, are the only strings longer than 103.

The results were obtained from a Very Large Scale Integration (VLSI) circuit chip [2] designed as a student project to search for binary strings in which 0 appears in at most three evenly spaced positions and 1 in at most six. Simple ‘backtracking’, Algorithm A in [1], was used. The chip executes this algorithm about 30 times faster than a DEC KL2050 computer, and completes a search of the solution space in about 88 hours.

References