Homework, the 1st series

Deadline: 5 April, 2013, 23:59

Let \( \text{Mult} \) be the language of words over the alphabet \( \{0, 1, *, =\} \) of the form \( a * b = c \), where \( a, b, c \in \{0, 1\}^* \) represent in binary some numbers \( A, B, C \in \mathbb{N} \), such that \( A * B = C \). For example, \( 11 * 101 = 1111 \) is in the language and \( 111 * 1 = 10 \) is not.

Show that the language \( \text{Mult} \) can be recognized by a deterministic Turing machine working in space \( S(n) = \mathcal{O}(\log n) \) (where \( n \) is the length of the input word).