1145-03-1434 **Mojtaba Moniri*** (mojtaba.moniri@normandale.edu). *Addition with or without multiplication: algorithms, maximality, and near-linearity.*

We first mention two algorithms for a certain sequence of nonnegative integers, one which calculates in $(\mathbb{Z}, +)$ in conjunction with the counting operator # and the exponential substitution, and applies to any positive integer input. The other algorithm calculates in $(\mathbb{Z}, +, \cdot)$, and is more efficient when the input is a power of 2.

Next, let F be an ordered field, D a maximal discrete subring of F, and G a maximal discrete additive subgroup of F. We point out that although there are examples where F has elements of infinite distance to D, it can never realize any gaps of G. For countable F, the subgroup G can be constructed Δ^0_2 relative to F.

Finally we consider some nonstandard models M of weak arithmetic which have $\mathbb{Z}$ as an additive direct summand. We present functions $f, g : M \to M$ whose value at a sum minus sum of values is always 0 or 1 yet for some $x, y, u, v \in M^{\geq 1}$, $f(xy) < xf(y)$ and $g(uv) > ug(v) + u - 1$. (Received September 21, 2018)