1152-11-181 **Eric Rowland*** (eric.rowland@hofstra.edu) and **Reem Yassawi**. *Restricted Lucas congruences for Apéry numbers modulo p^2.* Preliminary report.

In 1982 Ira Gessel showed that the Apéry numbers $A(n) = \sum_{k=0}^{n} \binom{n}{k}^2 \binom{n+k}{k}^2$ satisfy the Lucas congruence

$$A(n) \equiv A(n_0)A(n_1)\cdots A(n_\ell) \mod p,$$

where $n_\ell \cdots n_1 n_0$ is the standard base-p representation of n. Additionally, Gessel proved a Lucas congruence modulo 9:

$$A(n) \equiv A(n_0)A(n_1)\cdots A(n_\ell) \mod 9,$$

where $n_\ell \cdots n_1 n_0$ is the base-3 representation of n. For larger primes p, the analogous congruence modulo p^2 does not hold in general. However, if we restrict to certain sets of base-p digits, then we do obtain valid congruences modulo p^2. For example, if each digit in the base-5 representation of n belongs to $\{0, 2, 4\}$, then

$$A(n) \equiv A(n_0)A(n_1)\cdots A(n_\ell) \mod 25.$$

For each prime p, we identify a set of base-p digits that supports a restricted Lucas congruence for the Apéry numbers modulo p^2. These congruences were discovered experimentally, and their existence is partially explained by yet another result of Gessel. (Received September 03, 2019)