1030-05-403 **Robert S. Maier*** (rsm@math.arizona.edu), Mathematics Department, University of Arizona, Tucson, AZ 85721. *Transforming and reducing D-finite combinatorial sequences.* Preliminary report.

The solution $a := (a_n,\ n \in \mathbf{N})$ of a linear recurrence over $\mathbf{C}$ with polynomial coefficients, and its formal generating function $F_a := \sum_{n\in\mathbf{N}} a_n z^n$, are said to be D-finite. The case of an order-1 recurrence, when F_a is hypergeometric, is nicest. We explore the algorithmic reduction of an order-($>$1) recurrence to one of order 1, by manipulating the ODE satisfied by F_a. In particular, we consider reductions $F_a \to F_b$ of the form $F_a(z) = [1 - zQ(z)]^{-\theta}\, F_b(zP(z)/(1 - zQ(z)))$, with $P, Q \in \mathbf{C}[z]$, $\theta \in \mathbf{C}$. When a is a Heun sequence (one satisfying an order-2 recurrence with quadratic coefficients), we partially characterize when it may be so reduced. The characterization uses a classification of certain multisheeted covers of the Riemann sphere $\mathbf{P}^1(\mathbf{C})$ by itself. We give examples of nontrivial reductions, arising from the classical theory of automorphic functions. For instance, the Franel sequence $a_n = \sum_{k=0}^{n} \binom{n}{k}^3$, D-finite and of Heun type, can be reduced to a hypergeometric sequence $b_n,\ n \in \mathbf{N}$ in more than one way, due to relations among the modular groups $\Gamma_0(6), \Gamma_0(3), \Gamma_0(2), \Gamma(1)$. (Received August 07, 2007)