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We present an algorithm for computing hypergeometric solutions of a second order linear differential operator $L$ with rational function coefficients. Our algorithm searches for solutions of the form

$$\exp\left(\int r \, dx\right) \cdot \left(r_0 \cdot \binom{a_1, a_2}{b_1} f + r_1 \cdot \binom{a_1, a_2}{b_1} f'\right)$$

where $r, r_1, r_2, f \in \overline{\mathbb{Q}(x)}$, and $a_1, a_2, b_1 \in \mathbb{Q}$. Our algorithm has two components. The first tries to simplify $L$ using normalized integral bases. The goal is to reduce $r_1$ to 0. The second component tries to find $a_1, a_2, b_1, f$ using quotients of formal solutions, modular reduction, Hensel lifting, and rational reconstruction. (Received September 15, 2016)