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Computable, uniform, and strong reductions

In reverse mathematics, one establishes connections between mathematical principles by proving implications over the base theory RCA_0. In practice, such implications are often due to the presence of considerably stronger computability-theoretic reducibilities holding between the principles, which are then merely formalized in second-order arithmetic. For instance, a typical implication $P \rightarrow Q$ of Π^1_2 principles is a formalized *uniform* reduction, meaning that there are functionals Φ and Ψ such that, if A is any instance of P, then $\Phi(A)$ is an instance of Q, and if S is any solution to $\Phi(A)$, then $\Psi(A \oplus S)$ is a solution to A. The systematic study of this and related reducibilities in the specific context of Π^1_2 principles has recently emerged as a fruitful enterprise alongside traditional reverse mathematics. On the one hand, it offers a much finer way of calibrating the relative strength of mathematical propositions, and on the other, it sheds light on several open questions from the traditional analysis. This talk will present a summary of results and problems in this direction. In particular, I will discuss the longstanding open question of whether the stable form of Ramsey's theorem for pairs (SRT^2_2) implies the cohesive principle (COH) in standard models of RCA_0, and the growing number of recent results towards a negative answer.