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A double category of quantum sets, functions and relations

We introduce the double category $\mathbb{Q}$**Rel** of finite quantum sets, functions, and binary relations, building on the work of Weaver, Kornell, and Musto-Reutter-Verdon. It is a candidate for a †-compact double category in the sense that there is a † structure on squares that is compatible with the duals structure. In analogy to the classical case of the double category $\mathbb{R}$**el** of functions and relations, the 2-categories **QSet** of finite quantum sets and quantum functions, and **qRel** of finite quantum sets and binary relations arise as the horizontal and vertical 2-categories of $\mathbb{Q}$**Rel**.

Time permitting, we illustrate how $\mathbb{Q}$**Rel** models both new and existing quantizations of some constructions from classical graph theory and quantum information theory.