1154-03-1714 **Wesley H. Holliday*** (`wesholliday@berkeley.edu`). *Axiomatizing reasoning about sets: cardinality, mereology, and decisiveness.*

In this talk, I give three examples of axiomatizing reasoning about sets in special purpose languages. First, I consider reasoning about comparative cardinality: $A \geqslant B$ if there is an injection from B to A. I add principles to Boolean algebra to axiomatize reasoning not only about Boolean operations but also about $\geqslant$. Second, I consider reasoning about the subset relation ("set-theoretic mereology") in a modal language: $\Diamond\varphi$ is true at a set A if there is a nonempty $B \subseteq A$ such that φ is true at B. I discuss the longstanding open problem of giving a recursive axiomatization of the set of validities for finite sets. Finally, I give an example outside of pure mathematics from voting theory: a set A of voters is decisive over candidates x, y if whenever all voters in A prefer x to y, society must rank x above y. I present an axiomatization of reasoning about decisive sets of voters for voting methods satisfying well-known axioms. These examples are meant to illustrate a methodology familiar to modal logicians: to better understand the core principles governing some mathematical concept, try to axiomatize the validities of a lean language with dedicated operators whose semantics is given by the target concepts. (Received September 16, 2019)