

Logical Constants Across Varying Types

JOHAN van BENTHEM

Abstract We investigate the notion of “logicality” for arbitrary categories of linguistic expression, viewed as a phenomenon which they can all possess to a greater or lesser degree. Various semantic aspects of logicality are analyzed in technical detail: in particular, invariance for permutations of individual objects, and respect for Boolean structure. Moreover, we show how such properties are systematically related across different categories, using the apparatus of the typed lambda calculus.

1 The range of logicality Philosophical discussions of the nature of logical constants often concentrate on the connectives and quantifiers of standard predicate logic, trying to find out what makes them so special. In this paper, we take logicality in a much broader sense, including special predicates among individuals such as *identity* (“be”) or higher operations on predicates such as *reflexivization* (“self”).

One convenient setting for achieving the desired generality is that of a standard *Type Theory*, having primitive types e for entities and t for truth values, while forming functional compounds (a, b) out of already available types a and b . Thus, e.g., a one-place predicate of individuals has type (e, t) (assigning truth values to individual entities), whereas a two-place predicate has type $(e, (e, t))$. Higher types occur, among others, with quantifiers, when regarded in the Fregean style as denoting properties of properties: $((e, t), t)$. For later reference, here are some types, with categories of expression taking a corresponding denotation:

e	entities	proper names
t	truth values	sentences
(t, t)	unary connectives	sentence operators

Received January 8, 1988