Semantic Theory 2025: Exercise 6

Due by: Wednesday, June 4 at 10:00 am (before class)

Question 1

A model structure for plural terms is a tuple $M = ((U_M, \leq), V_M)$, where $(U_M, \leq)$ is an atomic join semi-lattice with universe U_M and individual part relation $\leq$, and V_M is an interpretation function mapping elements of the logical language to elements of the universe.

Consider the model M_1, where the universe U_{M_1} is generated by the following set of atoms: $\{a, b, j, m, s\}$.

a. Assume that $[\![\textit{John, Mary, and Bill sing}]\!]^{M_1} = 1$, $[\![\textit{Albert sings}]\!]^{M_1} = 1$, and $[\![X\ \textit{sing}(s)]\!]^{M_1} = 0$ for all other individuals (and proper sums) X for the predicate $\textit{sing} \in P_d$. Then:

$V_{M_1}(\textit{sing}) = ?$

b. Assume that $[\![\textit{John and Mary meet}]\!]^{M_1} = 1$, $[\![\textit{Albert and Sally meet}]\!]^{M_1} = 1$, $[\![\textit{Bill and Mary meet}]\!]^{M_1} = 1$, and $[\![X\ \textit{meet}]\!]^{M_1} = 0$ for all other individuals (and proper sums) X for the predicate $\textit{meet} \in P_c$. Then:

$V_{M_1}(\textit{meet}) = ?$

Question 2

Consider the following sentence: $S =$ "*two students summarized three papers*"

a. How many readings does the sentence S have? List all possible readings in natural language.

b. Translate each reading of S to the extended first-order logic for plural terms introduced in the lecture, which extends first-order logic with a $\oplus$ operator, a $\lhd$ operator, and variables $\mathrm{X}, \mathrm{Y}, \mathrm{Z}, \ldots$ ranging over proper sums: $\mathrm{X} \oplus \mathrm{Y}$ denotes the group consisting of X and Y, $\lhd$ denotes the part-of-relation.

You may (and should) also incorporate the function $N(\mathrm{X}) = |\{y \mid At(y) \wedge y \lhd \mathrm{X}\}|$ that takes a proper sum X and returns the number of atoms in X.