LIN6049 Advanced Semantics: Puzzles in Meaning
2022/2023

Handout 6: quantification I

Obligatory reading: Kearns (2011), pp. 96-103, on QM+
Optional reading: Kearns (2011), pp. 118-121, also on QM+

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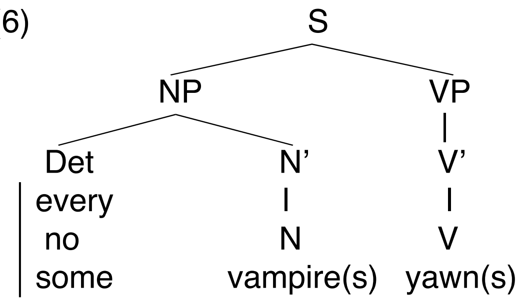
1 Quantifiers as relations between sets (from Introduction to Semantics; only atomic individuals!)

(1) *Every* vampire yawns
(2) *Most* vampires yawn
(3) *No* vampire yawns
(4) *Some* vampires yawn
(5) *Three* vampires yawn

Quantifiers: *every*, *most*, *some*, *no*...etc.
Quantifier phrases: *every vampire*, *most vampires*, *no vampires*, etc.

(6)



Both VPs and common nouns denote sets of individuals:

(7) $[\![\text{vampire(s)}]\!]^s = \{x: x \text{ is a vampire in } s\}$
(8) $[\![\text{yawn(s)}]\!]^s = \{x: x \text{ yawns in } s\}$

If a, b and c are the vampires of s, and b, c and d the yawning individuals:

(9) $[\![\text{vampire(s)}]\!]^s = \{a, b, c\}$
(10) $[\![\text{yawn(s)}]\!]^s = \{b, c, d\}$

Quantified NPs denote <u>sets of sets of individuals</u>:

(11) a. $[\![\text{every vampire}]\!]^s = \{Q : [\![\text{vampire}]\!]^s \subseteq Q\}$
b. $[\![\text{most vampires}]\!]^s = \{Q : |[\![\text{vampires}]\!]^s \cap Q| > |[\![\text{vampires}]\!]^s - Q|\}$
c. $[\![\text{no vampire}]\!]^s = \{Q : [\![\text{vampire}]\!]^s \cap Q = \emptyset\}$
d. $[\![\text{some vampires}]\!]^s = \{Q : [\![\text{vampires}]\!]^s \cap Q \neq \emptyset\}$
e. $[\![\text{three vampires}]\!]^s = \{Q : |[\![\text{vampires}]\!]^s \cap Q| = 3\}$

We need to use the second part of the subject-predicate rule to compute the meaning of the whole sentence:

Subject-predicate rule: If S has NP as its subject and VP as its predicate, $[\![S]\!]^s = 1$ in s if $[\![NP]\!]^s \in [\![VP]\!]^s$ **or** $\boldsymbol{[\![VP]\!]^s \in [\![NP]\!]^s}$

2 Taking grammatical number into account

(12) Every vampire yawns

$[\![\text{every vampire yawns}]\!]^s = 1$ iff

$[\![\text{yawns}]\!]^s \in [\![\text{every vampire}]\!]^s$

$= [\![\text{yawns}]\!]^s \in \{Q : [\![\text{vampire}]\!]^s \subseteq Q\}$

$= [\![\text{vampire}]\!]^s \subseteq [\![\text{yawns}]\!]^s$

Intuitively, if a, b and c are the vampires in s, and b, c and d the yawners in s, the sentence is false:

$[\![\text{vampire}]\!]^s = \{a, b, c\}$

$[\![\text{yawns}]\!]^s = \{b, c, d, bc, bd, cd, bcd\}$,

and $\{a, b, c\} \not\subseteq \{b, c, d, bc, bd, cd, bcd\}$ ✓

Intuitively, if a, b and c are the vampires in s, and a, b, c and d the yawners in s, the sentence is true:

$[\![\text{vampire}]\!]^s = \{a, b, c\}$

$[\![\text{yawns}]\!]^s = \{a, b, c, d, ab, ac, bc, bd, cd, \ldots, abc, \ldots, abcd\}$,

and $\{a, b, c\} \subseteq \{a, b, c, d, ab, ac, bc, bd, cd, \ldots, abc, \ldots, abcd\}$ ✓

(13) Some vampires yawn

$[\![\text{some vampires yawn}]\!]^s = 1$ iff

$[\![\text{yawn}]\!]^s \in [\![\text{some vampires}]\!]^s$

$= [\![\text{yawn}]\!]^s \in \{Q : [\![\text{vampires}]\!]^s \cap Q \neq \emptyset\}$

$= [\![\text{vampires}]\!]^s \cap [\![\text{yawn}]\!]^s \neq \emptyset$

Intuitively, if a, b and c are the vampires in s, and d, e and f the yawners in s, the sentence is false:

$[\![\text{vampires}]\!]^s = \{ab, bc, ac, abc\}$

$[\![\text{yawns}]\!]^s = \{d, e, f, de, df, ef, def\}$,

and $\{ab, bc, ac, abc\} \cap \{d, e, f, de, df, ef, def\} = \emptyset$ ✓

Intuitively, if a, b and c are the vampires in s, and a, b, d and e the yawners in s, the sentence is true:

$[\![\text{vampires}]\!]^s = \{ab, bc, ac, abc\}$

$[\![\text{yawns}]\!]^s = \{a, b, d, e, ab, ad, bd, de, \ldots, abd, \ldots, abde\}$,

and $\{ab, bc, ac, abc\} \cap \{a, b, d, e, ab, ad, bd, de, \ldots, abd, \ldots, abde\} = \{ab\} \neq \emptyset$ ✓

What about other quantified NPs? → Puzzle 6!

3 Taking collective VPs into account

(14) Some vampires met in the hallway

$[\![\text{some vampires met in the hallway}]\!]^s = 1$ iff

$[\![\text{met in the hallway}]\!]^s \in [\![\text{some vampires}]\!]^s$

$= [\![\text{met in the hallway}]\!]^s \in \{Q : [\![\text{vampires}]\!]^s \cap Q \neq \emptyset\}$

$= [\![\text{vampires}]\!]^s \cap [\![\text{met in the hallway}]\!]^s \neq \emptyset$

Intuitively, if a, b and c are the vampires in s, and a, d and e met in the hallway in s, the sentence is false:

$[\![\text{vampires}]\!]^s = \{ab, bc, ac, abc\}$

$[\![\text{met in the hallway}]\!]^s = \{ad, ae, de, ade\}$,

and $\{ab, bc, ac, abc\} \cap \{ad, ae, de, ade\} = \emptyset$ ✓

Intuitively, if a, b, c, d and e are the vampires in s, and a, b, c met in the hallway in s, the sentence is true:

$[\![\text{vampires}]\!]^s = \{ab, bc, ac, ad, bd, cd, ae, \ldots, abc, \ldots, abce, \ldots abcde\}$ ✓

$[\![\text{met in the hallway}]\!]^s = \{ab, bc, ac, abc\}$,

and $\{ab, bc, ac, ad, bd, cd, abc, \ldots, abcd\} \cap \{ab, bc, ac, abc\} = \{ab, bc, ac, abc\} \neq \emptyset$

(15) *Every vampire met in the hallway

$[\![\text{every vampire met in the hallway}]\!]^s = 1$ iff

$[\![\text{met in the hallway}]\!]^s \in [\![\text{every vampire}]\!]^s$

$= [\![\text{met in the hallway}]\!]^s \in \{Q: [\![\text{vampire}]\!]^s \subseteq Q\}$

$= [\![\text{vampire}]\!]^s \subseteq [\![\text{met in the hallway}]\!]^s$

Suppose that a, b and c are the vampires in s, and a, b and c met in the hallway in s:

$[\![\text{vampire}]\!]^s = \{a, b, c\}$

$[\![\text{met in the hallway}]\!]^s = \{ab, bc, ac, abc\}$,

and $\{a, b, c\} \not\subseteq \{ab, bc, ac, abc\}$

The sentence can never be true, as that last statement can never be satisfied, no matter what the facts are → the sentence is odd ✓