Elizabeth Coppock
coppock@phil.hhu.de
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Compositional Semantics
Heinrich Heine University
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Problem Set 6: First order predicate logic

Read:

- Dowty Wall and Peters (1981), chapter 2, pp. 56–66

Exercises:

1. Which of the following are well-formed formulas of L_1?
   (a) $M(d) \wedge M(d)$
   (b) $M(k)$
   (c) $M(d, d)$
   (d) $\neg\neg M(n)$
   (e) $\forall x\ M(x)$
   (f) $\forall x\ M(y)$
   (g) $\exists x\ K(x, x)$
   (h) $\exists x\ \exists z\ K(x, z)$
   (i) $\exists x\ K(x, z)$
   (j) $\exists\exists x\ K(x, x)$
   (k) $\exists x\ M(d)$
2. Of the ones that are well formed in L_1, which of the above formulas have free variables in them? (In other words, which of them are *open formulas*?)
3. Which of the above formulas are *sentences* of L_1?
4. Which of the above formulas contain *vacuous quantification*?
5. Let g be defined as in (3-2) ($x \mapsto c, y \mapsto b, z \mapsto a$), and let M be defined as on p. 61. Using the semantic rules given in A-B pp. 60–61, calculate the following:

(a) $[\![x]\!]^{M,g}$

(b) $[\![d]\!]^{M,g}$

(c) $[\![K]\!]^{M,g}$

(d) $[\![K(d,x)]\!]^{M,g}$

6. List all of the value assignments that are exactly like g except possibly for the individual assigned to x, and label them $g_1 ... g_n$.

7. For each of those value assignments g_i in the set $\{g_1, ..., g_n\}$, calculate $[\![K(d,x)]\!]^{M,g_i}$.

8. DWP say that "if a formula ϕ has one or more free variables then it may well be true with respect to some assignments and false with respect to others." Give an example of two variable assignments g_i and g_j such that $[\![K(d,x)]\!]^{M,g_i} \neq [\![K(d,x)]\!]^{M,g_j}$.

9. $[\![\forall x K(d,x)]\!]^{M,g} = 1$ iff for every value assignment g' such that g' is exactly like g except possibly for the individual assigned to x by g', $[\![K(d,x)]\!]^{M,g'} = 1$. So, what is $[\![\forall x K(d,x)]\!]^{M,g}$?

10. Problem (3-2), p. 66