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Compositional Semantics
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Model Answers to Problem Set 1, Part B

Reading: Heim and Kratzer (1998), chapter 1.

1. Let $A = \{a, b, c\}$ and $A' = \{A\}$.

   (i) Is A a subset of A'? **[Recall that X is a subset of Y if all of the members of X are members of Y.]**

   No; the elements of A are a, b, and c, and none of these are members of A', since the only member of A' is A.

   (ii) Is $\{A\}$ a subset of A'?

   Yes, $\{A\} = A'$ and every set is a subset of itself.

   (iii) Is A a member of A'?

   Yes.

   (iv) Is a a member of A'?

   No; the only member of A' is A.

2. List all of the subsets of A. Don't forget the empty set!

   $\{a, b, c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a\}, \{b\}, \{c\}, \emptyset$

3. Let $A = \{a, b, c\}$ and $B = \{a, d, e\}$.

   (i) What is the intersection of A and B?

   $\{a\}$

   (ii) What is the union of A and B?

   $\{a, b, c, d, e\}$

   (iii) What is the complement of A in B?

   $\{d, e\}$

4. True or false: $\langle a, b\rangle = \langle b, a\rangle$. Why?

   False [extra credit: unless a=b!], because the order matters in an ordered pair.

5. True or false: $\{a, b\} = \{b, a\}$. Why?

   True, because sets that have the same elements are equal.

6. Under what circumstances is a relation a function?

   When there is one and only one "output" for each "input"; for every object x that serves as the first element of an ordered pair in the relation R, there is one and only one object y such that $R(x, y)$.

7. Which of the following relations is a function:

(a) $\begin{bmatrix} a & \to & b \\ c & \to & b \\ d & \to & c \end{bmatrix}$ (b) $\begin{bmatrix} a & \to & a \\ c & \to & b \\ d & \to & c \end{bmatrix}$

Both! Trick question!

8. (i) What is the domain of the relation (a)?

$\{a, c, d\}$

(ii) What is its range?

$\{b, c\}$ **[Note: Technically this is equal to** $\{b, b, c\}$ **but I did not count the latter as a correct answer.]**

9. Give a function f such that $f(0) = 1$, $f(1) = 0$, $f(2) = 1$, $f(3) = 0$, $f(4) = 1$, and $f(5) = 0$.

$f(i) = 1$ **if** i **is even; otherwise** $f(i) = 0$**.**