

Ling 125: Homework due 2005/10/10

60 points total

1 Atomic sentences with constants and predicates

Assume for this homework that C, M and H are **one place predicates** and that T and L are **two place predicates**.

1. Which of the following (a–f) are sentences of first order logic? You may answer the question by circling the sentences and leaving the non-sentences unmarked. (6 points)

a. $c'M$

b. Td_{32}

c. Ht

d. $a''Ls_{15553}$

e. M_{13}

f. qL

2. Draw phrase structure trees for the following sentences. You may use P^1 or $PRED^1$ as a category symbol for one place predicates, P^2 or $PRED^2$ for two place predicates, and CONST for individual constants. Use S to mark a sentence. (10 points)

Md_{32}

sTa

Ci

3. Use the following model to assign truth values to the sentences in 2 (6 points):

- The universe is the set {Matt Damon, Abraham Lincoln, Xanadu, Xena, Sarah Michelle Gellar, The Incredible Hulk, iPod}.
- 'd₃₂' denotes Matt Damon; 'd' denotes Xanadu
- 'a' denotes Abraham Lincoln; 'n' denotes Xena
- 's' denotes Sarah Michelle Gellar; 'h' denotes the Hulk
- 'i' denotes the iPod.
- M denotes the set {Abraham Lincoln, Xanadu, Xena, The Incredible Hulk}
- C denotes the set {iPod}
- T denotes the relation {⟨Abraham Lincoln, Sarah Michelle Gellar⟩, ⟨Sarah Michelle Gellar, Matt Damon⟩, ⟨Xena, iPod⟩}

2 Connectives

4. Examine the following sentences, and interpret them from the model above. Circle the true sentences and leave the false sentences unmarked. (16 points)

- | | | | |
|-----------------------------------|------------------------------|-------------------------------|-------------------------|
| a. $(Ca \ \& \ Md)$ | b. $(Ca \ \vee \ Md)$ | c. $(Mi \ \rightarrow \ sTa)$ | d. $(Mi \ \equiv \ Ma)$ |
| e. $(Ci \ \rightarrow \ Cd_{32})$ | f. $(Cd_{32} \ \equiv \ Mi)$ | g. $(Ci \ \vee \ Ma)$ | h. $(Ca \ \& \ Mi)$ |

3 Identity

5. Here's your chance to show me a little bit of creativity (although grading will be strictly on the basis of correctness). Give a simple model with at least three individual constants (that is, tell me what objects there are in your universe and what the individual constants stand for or "denote"). Make sure that there is at least one pair of constants that stand in the identity relation and one pair that doesn't, and tell me which ones those are. (12 points)

4 Quantification

Evaluate the following sentences against the model on the previous page. Circle the true sentences and leave the false sentences unmarked. Also, for the **true sentences** with an **existential quantifier**, show a way to choose the denotation of the variable(s) that makes the sentence true; for **false sentences** with a **universal quantifier** show a way to choose the denotation of the variables to make the sentence false. (10 points)

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|--------------------------------|--|--|
| a. $\exists wCw$ | b. $\exists x(Cx \ \& \ Mx)$ | c. $(\exists zCz \ \& \ \exists zMz)$ |
| d. $\forall y(My \ \vee \ Cy)$ | e. $\forall u(Cu \ \rightarrow \ u=i)$ | f. $\forall v(Cv \ \rightarrow \ nTv)$ |