

# Exercises for Logic-for-Linguists II

Thomas Forster

November 11, 2009

## EXERCISE 1

*Render the following fragments of English into predicate calculus, using a lexicon of your choice.*

*This first bunch involve monadic predicates only and no nested quantifiers.*

*In my model answers I have tended to use bits of English text in **verbatim** font (as is the habit in certain computer science cultures) for predicate letters, rather than use the single letters that are more customary in most logical cultures. I have done this merely in order to make the notation more suggestive: there is no cultural significance to it. And in any case, further down in the list of model answers I have reverted to the philosophico-logical standard practice of using single capital Roman letters.*

1. *Every good boy deserves favour; George is a good boy. Therefore George deserves favour.*
2. *All cows eat grass; Daisy eats grass. Therefore Daisy is a cow.*
3. *Socrates is a man; all men are mortal. Therefore Socrates is mortal.*
4. *Daisy is a cow; all cows eat grass. Therefore Daisy eats grass.*
5. *Daisy is a cow; all cows are mad. Therefore Daisy is mad.*
6. *No thieves are honest; some dishonest people are found out. Therefore Some thieves are found out.*
7. *No muffins are wholesome; all puffy food is unwholesome. Therefore all muffins are puffy.*
8. *No birds except peacocks are proud of their tails; some birds that are proud of their tails cannot sing. Therefore some peacocks cannot sing.*
9. *A wise man walks on his feet; an unwise man on his hands. Therefore no man walks on both.*
10. *No fossil can be crossed in love; an oyster may be crossed in love. Therefore oysters are not fossils.*

11. *All who are anxious to learn work hard; some of these students work hard. Therefore some of these students are anxious to learn.*
12. *His songs never last an hour. A song that lasts an hour is tedious. Therefore his songs are never tedious.*
13. *Some lessons are difficult; what is difficult needs attention. Therefore some lessons need attention.*
14. *All humans are mammals; all mammals are warm blooded. Therefore all humans are warm-blooded.*
15. *Warmth relieves pain; nothing that does not relieve pain is useful in toothache. Therefore warmth is useful in toothache.*
16. *Louis is the King of France; all Kings of France are bald. Therefore Louis is bald.*

**EXERCISE 2** *Render the following into Predicate calculus, using a lexicon of your choice. These involve nestings of more than one quantifier, polyadic predicate letters, equality and even function letters.*

1. *Anyone who has forgiven at least one person is a saint.*
2. *Nobody in the logic class is cleverer than everybody in the history class.*
3. *Everyone likes Mary—except Mary herself.*
4. *Jane saw a bear, and Roger saw one too.*
5. *Jane saw a bear and Roger saw it too.*
6. *God will destroy the city unless there is a righteous man in it;*
7. *Some students are not taught by every teacher;*
8. *No student has the same teacher for every subject.*
9. *Everybody loves my baby, but my baby loves nobody but me.*

**EXERCISE 3** *Match up the formulæ on the left with their English equivalents on the right.*

- |  |   |
|--|---|
| (i) $(\forall x)(\exists y)(x \text{ loves } y)$   | (a) <i>Everyone loves someone</i>               |
| (ii) $(\forall y)(\exists x)(x \text{ loves } y)$  | (b) <i>There is someone everyone loves</i>      |
| (iii) $(\exists y)(\forall x)(x \text{ loves } y)$ | (c) <i>There is someone that loves everyone</i> |
| (iv) $(\exists x)(\forall y)(x \text{ loves } y)$  | (d) <i>Everyone is loved by someone</i>         |

These involve nested quantifiers and dyadic predicates

**EXERCISE 4** *Render the following pieces of English into Predicate calculus, using a lexicon of your choice.*

1. *Everone who loves is loved;*
2. *You are loved only if you yourself love someone;*
3. *Everyone loves a lover;*
4. *God will destroy the city unless there are three righteous men in it;*
5. *None but the brave deserve the fair.*
6. *I know (at least) two pop stars*
7. *The only living Nobel prizewinner I know is Andrew Huxley.*
8. *There is at most one king of France.*
9. *I know no more than two pop stars;*
10. *There is precisely one king of France*
11. *I know three FRS's and one of them is bald;*
12. *Brothers and sisters have I none; this man's father is my father's son.*
13. *\* Anyone who is between a rock and a hard place is also between a hard place and a rock.*

*(What disconcerts the punters is that the words 'two' and 'three' don't appear in the lexicon.0*