

Question 1 (30%)

You have two predicates p and q . Express the following situations in first order logic:

- (a) there is no p that is not also q .
- (b) there is exactly one p .
- (c) there are exactly two p .
- (d) there is at most one p .

Question 2 (20%)

Render the following sentence in first order logic.

- (1) Every farmer who owns a donkey beats it.

If you cannot come up with a satisfactory formula, briefly comment on why your efforts have failed.

Question 3 (50%)

Specify a lexicon for all the items in the following sentences and drive their meaning specifying their order of combination, syntactic categories, semantic interpretations and semantic types in each step:

- (a) Every donkey sleeps.
- (b) John walks slowly.
- (c) A lazy donkey walks.
- (d) Every student and a lazy donkey walks.