

Deadline: Dec. 3 (flexible as long as you submit before the final exam; please submit early if you want it to be graded before the final exam).

Please upload your assignment to Moodle, and also bring a paper copy to class. This assignment will be graded anonymously, so please don't list your name, but only your MAC ID.

As noted by the syllabus as well as in class, the scope, content, and convention of assignments are set by lectures, instead of any specific textbook. Please beware that different textbooks may use different symbolism or definitions.

Assignments are meant to be challenging! You are encouraged to discuss your answers with other students (but write up your own answers individually).

**Please make sure your handwriting is legible.**

1. Please explain, as we did in class, why  $\exists x(F(x) \rightarrow G(x))$  is inadequate for symbolizing “some F are G” and why  $\forall x(F(x) \wedge G(x))$  is inadequate for “all F are G”.
2. Formalize the following sentences in predicate logic—use quantifiers if needed. You can use one-letter notations for predicates and individual names; specify what they stand for. Indicate cases of ambiguity and formalize the various readings.

Hint: you might need to use two quantifiers for one sentence.

- (1) Nothing is perfect.
- (2) Not everything is tasty.
- (3) All physical objects are subject to gravity.
- (4) Everyone is happy.
- (5) Some birds fly.
- (6) Some dogs don't bark.
- (7) No cute animal is gonna survive in the desert.
- (8) Not every baby cries in the middle of the night.
- (9) There is at least one person who knows everyone.
- (10) Everyone loves someone.
- (11) All students who like Jack do not like Harry.
- (12) Every happy dog is liked by some happy human.

- (13) Abe owns a house which no one likes.
- (14) Bonnie will not show up unless some friend of hers does.
- (15) No one means all he says.

3. (Optional) Formalize the following sentences in predicate logic.

- (1) Claire and Edith like the same men.
- (2) Harry likes a woman who likes all happy men.
- (3) Some people likes all women who like themselves.
- (4) Ann is liked by every comedian who likes some old movies.
- (5) Each state can have for enemies only other states, and not men.
- (6) You can fool some of the people all the time, or all the people some of the time, but you cannot fool all people all time.
- (7) Someone says all he means.
- (8) Unless liked by a voter, no politician is happy.