

Guidelines:

There are **10 questions** in this assignment, they are worth 0.5 points each. Together they amount to 5 points. This assignment is worth **5% of the final grade**.

Please keep in mind:

1. You should *type* your answers in the designated place in **Canvas**. Unfortunately, *not attachment* or any other format is acceptable.
2. You should type down your answers *directly* in **Canvas**. If you type them down in another software and then copy-paste them in **Canvas**, the symbols and some other items might change. It is your responsibility to make sure that your answers are readable in **Canvas**.
3. It is your responsibility to ascertain that the file you submit is **clear** and **readable**.
4. Do not forget to submit your assignment after you are done with typing down your answers or uploading your file. If you do not submit your assignment, it remains as a draft. Drafts are not marked.
5. Please number your answers so we can recognize which answer belongs to which question.

Questions:

Consider the difference between **Expression**, **Formula** and **Sentence** in **FOL**

Question 1 (0.5 points)

Is the following an **expression** of FOL?

$$Q(x,y) \rightarrow \forall B(x)$$

Question 2 (0.5 points)

The following is a **sentence** of FOL. What are the scopes of the two **quantifiers**?

$$\forall x(Q(p) \leftrightarrow (A(x,c) \wedge \exists y(R(y) \wedge Q(x)))) \rightarrow T(d,a)$$

Question 3 (0.5 points)

Which are, if any, the **free variables** in the following formula of FOL?

$$G(b,y) \rightarrow \exists x F(a,x)$$

Question 4 (0.5 points)

Is the following a formula of FOL?

$$\exists y(Q(y) \wedge R(y))$$

Question 5 (0.5 points)

Is the following a sentence of FOL?

$$\forall y A(y) \leftrightarrow \exists x B(a,x)$$

For the next 5 questions (6-10):

- 1) provide a symbolization key (one key for all sentences)
- 2) a domain
- 3) then symbolize the following English sentences into FOL

Question 6 (0.5 points)

“Not all movies are artsy”

Question 7 (0.5 points)

“All teachers like some movies”

Question 8 (0.5 points)

“Some artsy movies are boring, and some boring teacher is artsy”

Question 9 (0.5 points)

“Only Amy likes artsy movies”

Question 10 (0.5 points)

“At least one artsy movie is not boring”

End Of Assignment 3