# COMMENTS OBLIG 2 INF3580 SPRING 2010

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## Question 1

- Use correct identifiers. It is important that identifiers for classes and properties are correct and that the correct namespaces are used. If not, than the data in the file `popPlaces.ttl` will not be understood as intended and your SPARQL query in exercise 3 is not likely to work.

### Changing identifiers

How to change the full identifier of a property `places:lang` to `pop:lang`, where `pop:` is the namespace as given in the exercise text and `places:` is the default namespace defined in the ontology?

- Answer 1, using Protégé: Select the property `places:lang`, which is probably shown as just `lang` in Protégé, since identifiers are usually just shown with their localname and not by their full identifier, e.g., `http://inf3580.ifi.uio.no/places#lang` or qualified identifier, e.g., `places:lang`. (Note you can change this under File -> Preferences . . . -> Renderer.) Go to Refactor -> Change entity URI -> Tick "Show full URI" and tick "Change all entities with this URI". Now change

  ```
  http://inf3580.ifi.uio.no/places#lang
  ```

  to

  ```
  http://www.w3.org/2003/01/geo/wgs84_pos#lang.
  ```

- Answer 2, using a text editor: After you have created the ontology, save it to file, open the file in a text editor and use "search and replace".

## Question 2

- In questions (a) and (b) an informal explanation—or no explanation at all—of why the answer is yes or no is not enough. You will have to show by way of semantics that, if you believe the answer is yes, it is not possible to create a countermodel, or, if you believe the answer is no, create a countermodel.

## How to create a countermodel

Informally, a countermodel is a witness refuting the validity of some statement(s). If the statement is “All apples are red” a countermodel to this claim would be to show an apple that is not red. A countermodel for the entailment question “does it follow from A that B?” is an interpretation[1] where A is true and B is false. This interpretation shows that it is not that case that B is true whenever A is true, by which it follows that B cannot be an entailment of A. A countermodel for the entailment question in exercise 2 (a) is an interpretation making the ontology and the triples given in the exercise text for question 2 true, while at the same time interpreting `:a` and `:b` as the same object in the domain, such that the statement “ `:a` and `:b` are different” is false.

## How to create an interpretation

An interpretation $I$ fixes

- a set $\Delta^I$, the domain, and
- $A^\Delta \subseteq \Delta^I$ for each atomic concept $A$,
- $R^\Delta \subseteq \Delta^I \times \Delta^I$ for each role $R$, and
- $a^I \in \Delta^I$ for each name $a$.

Let us create an interpretation which satisfies the ontology on shown on slide 32 of Lecture 11, i.e., the set of sentences:

- $\{$Vehicle $\sqsubseteq \top$,
- Engine $\sqsubseteq \top$,
- Car $\sqsubseteq$ Vehicle,
- Car $\sqsubseteq \exists$hasPart.Engine,
- Car(myBeetle),
- Engine(theEngine),
- hasPart(myBeetle, theEngine)$\}$

First we need to create an interpretation $I$ satisfying the all sentences above.

1. Fix a domain, $I^\Delta$. To show that the model does not have to be related by names to what the ontology is about (although you might find that useful, e.g., car registration numbers and engine numbers) I set my domain to $I^\Delta = \{1, 2, 3, 4, 5, 6, 7, 8\}$.
2. For each atomic concept $A$, fix a set $A^I$: Vehicle$^I = \{1, 2, 3, 4, 5\}$, Engine$^I = \{6, 7\}$ and Car$^I = \{1, 2, 3\}$.
3. For each role $R$, fix $R^I \subseteq \Delta^I \times \Delta^I$: hasPart$^I = \{(1, 6), (2, 6), (3, 8), (3, 7)\}$
4. For each name $a$, fix $a^I \in \Delta^I$: myBeetle$^I = 1$, theEngine$^I = 6$.

[1] The words “interpretation” and “model” are often used interchangeably.

Now we need to check that the constructed interpretation $I$ satisfies all the axioms in the ontology. I will only show this for three of the axioms, in the exercise you should go through them all.

- $I$ satisfies the axiom Car $\sqsubseteq$ Vehicle, since Car$^I \subseteq$ Vehicle$^I$, since $\{1, 2, 3\} \subseteq \{1, 2, 3, 4, 5\}$.
- $I$ satisfies Car(myBeetle), since myBeetle$^I = 1$ and $1 \in$ Car$^I = \{1, 2, 3\}$.
- $I$ satisfies hasPart(myBeetle, theEngine), since myBeetle$^I = 1$, theEngine$^I = 6$ and $(1, 6) \in$ hasPart$^I = \{(1, 6), (2, 6), (3, 8), (3, 7)\}$.

Continue such arguments for all the axioms in the set of sentences to ensure that the interpretation is a correct model for the sentences.

## Question 3

### Subclass vs. equivalent class

Modelling Town and Metropolis correctly. If a town is modelled as a subclass of “a place which has a population of at least 10000” it will not give the expected results when the ontology and data is queried for all towns. The reason is that this specification requires that all towns is a place with a population of at least 10000, and it does not require that all places with a population of at least 10000 is a town. What we want is that the class Town is *exactly* the class of places which has a population of at least 10000, i.e., that the class Town is *defined* as is class, thus making “Town” really a different name for “the class of places with a population of at least 10000”. In OWL this is done by specifying that the class Town is *equivalent*, and not a subclass of, the class of places with a population of 10000 or more.