Exercises on DL

1. Define the following concept: Attendee (of some work-life balance workshop) is a working mother employed by the University of Nottingham. Assume that you have an atomic concept Woman, roles Child and Employer, and a constant uon for the University of Nottingham.

2. Describe someone all of whose children only have female children themselves (that is a person who only has granddaughters, if he or she has any grandchildren).

3. Describe someone who has children, and all of whose children have children.

4. (a) Do $d_1 \sqsubseteq d_2$ and $d_2 \sqsubseteq d_3$ entail $d_1 \sqsubseteq d_3$?
   (b) Do $c \rightarrow d_1$ and $d_2 \sqsubseteq d_1$ entail $c \rightarrow d_2$?
   (c) Do $c \rightarrow d_1$ and $d_1 \sqsubseteq d_2$ entail $c \rightarrow d_2$?

Answer

1. $Attendee \doteq$ [**AND** $Woman$ [**EXISTS** 1 $Child$] [**FILLS** $Employer$ uon]]

2. [**ALL** : $Child$ $Woman$] describes someone all of whose children are female, and we want to say that someone's children are described by this concept, so we say [**ALL** : $Child$ [**ALL** : $Child$ $Woman$]].

3. To say than someone has children we can use [**EXISTS** 1 : $Child$] and to describe someone all of whose children have children we can use [**ALL** : $Child$ [**EXISTS** 1 : $Child$]]. Since we want the concept to satisfy both properties, we say

   [**AND** [**EXISTS** 1 : $Child$] [**ALL** : $Child$ [**EXISTS** 1 : $Child$]]]

4. (a) Do $d_1 \sqsubseteq d_2$ and $d_2 \sqsubseteq d_3$ entail $d_1 \sqsubseteq d_3$?
   Yes: if $d_1 \sqsubseteq d_2$ and $d_2 \sqsubseteq d_3$ are true it means that $I(d_1) \subseteq I(d_2)$ and $I(d_2) \subseteq I(d_3)$ so $I(d_1) \subseteq I(d_3)$, and the latter means that $d_1 \sqsubseteq d_3$ is true.

   (b) Do $c \rightarrow d_1$ and $d_2 \sqsubseteq d_1$ entail $c \rightarrow d_2$?
   No: Consider I such that $I(c) \in I(d_1)$ and $I(d_2)$ is empty. Then the first two sentences are true but $c \notin I(d_2)$ so $c \rightarrow d_2$ is false.

   (c) Do $c \rightarrow d_1$ and $d_1 \sqsubseteq d_2$ entail $c \rightarrow d_2$?
   Yes: If the first two sentences are true, then $I(c) \in I(d_1)$ and $I(d_1) \subseteq I(d_2)$ so it has to hold that $I(c) \in I(d_2)$ which means $c \rightarrow d_2$ is true.