# Two Quick Tips for Lesson 7

## 1. Uniform Replacement

When you decompose a proposition, replacement of bound variables with object constants / names needs to be uniform. Here is an example:

| | | |
|---|---|---|
| 1 | (∀x)Lxx | P |
| 2 | Laa | 1∀D – Yes! |
| 3 | Lbb | 1∀D – Yes! |
| 4 | Lcc | 1∀D – Yes! |
| 5 | Lab | 1∀D – NO! |

Okay, so why is that? Well, if (1) says "Everyone loves themselves", when we decompose that proposition, we are displaying a situation in which it is true. Now look at (2), that says "a loves a." If (1) is true, then it is true if and only if “a loves a”, and likewise, if (1) is true, it is true if and only if “b loves b” (line 3). However, (5) says "a loves b". While (2), (3), and (4) all are true if (1) is true, (5) need not be true if “everyone loves themselves” since (5) says “a loves b” or someone loves someone else.

In short, *if you ever replace more than one variable* (x, y, z), *make sure the replacement is uniform*.

## 2. Using ∃D on Predicate Logic Trees

First, whenever you use ED, similar to other tree rules, make sure that the replacement of variables (x, y, z) with names (a, b, c) is uniform. For example,

| | | |
|---|---|---|
| 1 | (∃x)Lxx | P |
| 2 | Laa | 1∃D – Yes! |
| 3 | Lab | 2∃D – No! |

(1) says that "someone loves **themselves**", it does not say "someone loves someone."

Second, when using ED, you must replace variables (x, y, z) with names (a, b, c) that are not previously found in the branch that contains the existentially quantified proposition you are decomposing. For example,

| | | |
|---|---|---|
| 1 | Laa | P |
| 2 | (∃x)Bx | P |
| 3 | Bb | 2∃D – Yes! |

| | | |
|---|---|---|
| 4 | Ba | 2∃D – No! |

Let's suppose that (1) says "a loves a" and (2) says "someone is beautiful". Well, in saying "someone is beautiful" we don't have a particular person in mind, we are just saying "someone", but in saying that "a loves a" we are saying a particular (identified) person loves themselves. The important thing is that we are not saying that the person who loves themselves is the same person who is beautiful. So, to make sure we aren't saying that, we are picking a different name, i.e. any letter that is not "a". In short, when using ∃D, pick a name (a, b, c) to replace the existentially bound variables (x, y, z) that is *not found in the branch*.