7.4.s. Summary

7.4.1. Although our way of analyzing multiple generalizations forces us to assign differences in relative scope to the quantifier phrases, these differences do not always affect the propositions expressed. One example of this is a sentence containing two affirmative direct quantifier phrases. We can analyze these in either order, and the result of either analysis can be thought of as a generalization concerning pairs of values. Such generalizations are sometimes restricted to pairs whose members stand in a certain relation. In this case, we may leave the quantifier with widest scope unrestricted, using the relation to restrict the quantifier with narrower scope.

7.4.2. In many other cases, the scope assigned to quantifier phrases makes a difference. This is usually true in cases where there are negative generalizations. Subject-predicate expansion can be used to see which quantifier phrase should be given widest scope, but there are other signs. For example, *any* can be used in contrast to *every* to indicate that an affirmative generalization has wider scope than a negative generalization. It also can be used to show that one quantifier phrase that appears in the class indicator of another nevertheless has wider scope. Uses of *every* that contrast with *any* have the opposite significance.

7.4.x. Exercise questions

1. Analyze the following in as much detail as possible:

- **a.** *Every picture pleased everyone*.
- **b.** *No picture pleased everyone*.
- **c.** *No picture pleased anyone*.
- **d.** *Each provision of the law affected every sector of the economy*.
- **e.** *No picture pleased anyone except photographers*.
- **f.** *Anyone who likes all mammals likes all horses*.
- **g.** *The law stimulated only sectors of the economy that were affected by all its provisions*.
- **h.** *No one who doesn't like all mammals likes any badger*.
- **i.** *Everyone saw everything that anyone saw*.
- **j.** *No one saw anything that anyone liked*.
- **k.** *No one who anyone could recall spoke to everyone*.
- **l.** *No one who everyone could recall spoke to anyone*.
- **m.** *Of the pictures anyone saw, no candid ones pleased everyone in them*.
- **n.** *No law will affect only sectors of the economy that figure in all its provisions*.

2. In the logical forms below, indicate the scope of connectives and quantifiers and the patterns of binding of variables as in the example below (where a vertical line is used to mark a free occurrence of the variable y).

- **a.** ∀x Fx → ∀y Gy
- **b.** ∀x (Fx → ∀y Gy)
- **c.** ∀y (∀x Fx → Gy)
- **d.** ∀y ∀x Fx → Gy
- **e.** (∀x: ∀y Rxy) Fx
- **f.** ∀y (∀x: Rxy) Fx
- **g.** (∀x: Rxy) ∀y Fx
- **h.** (∀x: ∀y Rxy) Pxy

3. Synthesize idiomatic English sentences that express the propositions associated with the following logical forms using the intensional interpretation below. The way quantifiers are most naturally stated in English can depend on what other quantifiers in the sentence, so you may need to back up and revise the way you put one quantifier into English in order to state another.

[B: λxy (x *has bitten* y); D: λxy (x *despises* y); M: λx (x *is a mosquito*); P: λx (x *is a person*); S: λxy (x *is smaller than* y)]

- **a.** (∀x: Mx) (∀y: Py) Dxy
- **b.** (∀x: Px) ¬ (∀y: My) Dxy
- **c.** (∀x: Mx) (∀y: Py) ¬ Dyx
- **d.** (∀x: Px) (∀y: My ∧ Byx) ¬ Dxy
- **e.** (∀x: Px ∧ (∀y: My) Dxy) (∀z: Mz) ¬ Bzx
- **f.** ∀x (∀y: Sxy) ¬ Syx

Homework assigned Mon 11/7 and due Wed 11/9

(i) Analyze the following and restate the result using unrestricted quantifiers:

No one spoke to everyone

(ii) Synthesize an English sentence that has the following analysis:

∀x (∀y: Py ∧ Syx) Syt

[P: λx (x *is a person*); S: λxy (x *spoke to* y); t: *Tom*]