L(xy): x loves y . (Assume the universe of discourse is all people.)

1. $\bigwedge x \bigwedge y\, L(xy)$ **Everyone loves everyone.**

2. $\bigwedge x \bigvee y\, L(xy)$ **Everyone loves someone.**

3. $\bigvee x \bigwedge y\, L(xy)$ **Someone loves everyone.**

4. $\bigvee x \bigvee y\, L(xy)$ **Someone loves someone.**

5. $\bigwedge y \bigwedge x\, L(xy)$ **Everyone is loved by everyone.**

6. $\bigwedge y \bigvee x\, L(xy)$ **Everyone is loved by someone.**

7. $\bigvee y \bigwedge x\, L(xy)$ **Someone is loved by everyone.**

8. $\bigvee y \bigvee x\, L(xy)$ **Someone is loved by someone.**

Notice that where all the quantifiers are the same [all universal in (1) and (5); all existential in (4) and (8)] the sentences are equivalent -- just paraphrased from the active voice to the passive. But where the quantifiers are mixed, the sentences may differ in truth value. NB: Compare (2) and (7).

Now assume the universe of discourse is all things. Introduce a predicate letter "F" to abbreviate
Fx: x is a person. The (1)-(4) above become.

I. $\bigwedge x \bigwedge y\, [Fx \wedge Fy \rightarrow L(xy)]$

II. $\bigwedge x [Fx \rightarrow \bigvee y\, (Fy \wedge L(xy))]$

III. $\bigvee x [Fx \wedge \bigwedge y\, (Fy \rightarrow L(xy))]$

IV. $\bigvee x \bigvee y\, [Fx \wedge Fy \wedge L(xy)]$

As an exercise you should try to relativize (5)-(8) to the predicate "F".

No one loves everyone.

$\sim\bigvee x \bigwedge y\ L(xy)$ **(denial of (3))**

By QN: $\bigwedge x \bigvee y \sim L(xy)$

No one loves anyone

$\sim\bigvee x \bigvee y\ L(xy)$ **(denial of (4)**

By QN: $\bigwedge x \bigwedge y \sim L(xy)$

Anyone who loves everyone is loved by everyone.

$\bigwedge x [\bigwedge y\ L(xy) \rightarrow \bigwedge z\ L(zx)]$

Noone who loves everyone is loved by anyone.

$\bigwedge x\ [\bigwedge y\ L(xy) \rightarrow \sim \bigvee z L(zx)]$ **or**

$\sim\bigvee x [\bigwedge y\ L(xy) \wedge \bigvee z L(zx)]$

Anyone who does not love their mother does not love anyone at all.[Use M(ab): b is a's mother.]

$\bigwedge x \bigwedge y\ [M(xy) \wedge \sim L(xy) \rightarrow \sim \bigvee z\ L(xz)]$

Only those who love their parents love themselves. [Use M as above and F(ab): b is the father of a]

$\bigwedge x [L(xx) \rightarrow \bigwedge y \bigwedge z$
$(M(xy) \wedge F(xz) \rightarrow L(xy) \wedge L(xz))]$

$\vee y \wedge x\ F(xy) \Rightarrow \wedge x \vee y\ F(xy)$, but not conversely.

E.g., Suppose $F(xy)$: y is the mother of x.

Then $\wedge x \vee y\ F(xy)$ says
everyone has a mother.

But $\vee y \wedge x\ F(xy)$ says
there is a mother of us all.

~~Show~~ $\wedge x \vee y\ F(xy)$

1.	$\wedge x\ F(xa)$	Prem, EI ("a" new)
2.	$F(xa)$	1, UI
3.	$\vee y\ F(xy)$	2, EG