Peter Smith, *Introduction to Formal Logic* (CUP, 2nd edition)

Exercises 30: More QL translations

In QL_2, the proper names with their interpretations are

m: Maldwyn,
n: Nerys,
o: Owen;

and the predicates are

F: ① is a man,
G: ① is a woman,
L: ① loves ②,
M: ① is married to ②,
R: ① is a child of ② and ③.

The domain of quantification: people (living people, for definiteness).

(a) Translate the following into QL_2:

(1) Maldwyn loves anyone who loves Owen.
(2) Everyone loves whoever they are married to.
(3) Some man is a child of Owen and someone or other.
(4) Whoever is a child of Maldwyn and Nerys loves them both.
(5) Owen is a child of Nerys and someone who loves Nerys.
(6) Some men do not love those who they are married to.
(7) Every man who loves Nerys loves someone who is married to Owen.
(8) No woman is loved by every married man.
(9) Everyone who loves Maldwyn loves no one who loves Owen.
(10) Whoever loves Maldwyn loves a man only if the latter loves Maldwyn too.
(11) Only if Maldwyn loves every woman does he love whoever is married to Owen.
(12) No one loves anyone who has no children.

(b) Now consider the language QL_3 whose quantifiers range over the positive integers, with the following glossary:

n: one,
F: ① is odd,
G: ① is even,
H: ① is prime,
L: ① is less than ②,
R: ① is the sum of ② and ③.

Then translate the following into natural English (they are not all true!):

(1) $\forall x \forall y \exists z Rzxy$
(2) $\exists y \forall x Lxy$
(3) $\forall x \exists y (Lxy \land Hy)$
(4) $\forall x (Hx \to \exists y (Lxy \land Hy))$
(5) $\forall x \forall y ((Fx \land Ryxn) \to \neg Fy)$
(6) $\forall x \exists y ((Gx \land Fy) \land Rxyy)$
(7) $\forall x \forall y (\exists z (Rzxn \land Ryzn) \to (Gx \to Gy))$
(8) $\forall x \forall y \forall z (((Fx \land Fy) \land Rzxy) \to Gz)$
(9) $\forall x ((Gx \land \neg Rxnn) \to \exists y \exists z ((Hy \land Hz) \land Rxyz))$
(10) $\forall x \exists y ((Hy \land Lxy) \land \exists w \exists z ((Rwyn \land Rzwn) \land Hz))$