Exercises 23

A   Suppose 'm' stands for Socrates, 'n' stands for Plato, 'o' stands for Aristotle, 'Fx' means *x is a philosopher*, 'Gx' means *x is wise*, 'Mxy' means *x taught y*. Take the domain of discourse to consist of people. And then translate the following into QL:

1.   Socrates taught Plato and Plato taught Aristotle.
2.   Aristotle taught neither Socrates nor Plato.
3.   Plato taught someone.
4.   Some philosophers are wise.
5.   Some wise people aren't philosophers.
6.   No one taught Socrates.
7.   If Socrates taught Plato, then someone taught Plato.
8.   Whoever Socrates taught is wise.
9.   Any philosopher who was taught by Plato taught Aristotle.
10. No wise philosopher was taught by Aristotle.

B   Which of the following pairs of wffs are equivalent (i.e. imply each other), and why? When they aren't equivalent, give interpretations to illustrate the non-equivalence.

1. $\exists x \forall y \exists z Ryxz$; $\exists z \forall y \exists x Ryzx$
2. $\exists x \forall y \exists z Ryxz$; $\exists z \forall x \exists y Rxyz$
3. $(\forall x Fx \supset Fn)$; $(\forall z Fz \supset Fn)$
4. $(\forall x Fx \supset \forall x Fx)$; $(\forall z Fz \supset \forall y Fy)$
5. $\exists x \exists y Lxy$; $\exists y \exists x Lxy$
6. $\forall x \forall y Lxy$; $\forall y \forall x Lxy$
7. $\forall x(Fx \wedge Gx)$; $(\forall x Fx \wedge \forall x Gx)$
8. $\forall x(Fx \vee Gx)$; $(\forall x Fx \vee \forall x Gx)$
9. $\exists x(Fx \wedge Gx)$; $(\exists x Fx \wedge \exists x Gx)$
10. $\exists x(Fx \vee Gx)$; $(\exists x Fx \vee \exists x Gx)$

C   We can render 'Plato and Aristotle are philosophers' by e.g. '$(Fm \wedge Fn)$'. Why can't we render 'Plato and Aristotle are classmates' by something like '$(Gm \wedge Gn)$'? Consider other cases of predicates *F* where we can't render something of the form 'Plato and Aristotle are *F*' by something of the type '$(Fm \wedge Fn)$'. What can be learnt from such cases about the expressive limitations of QL?