

Submission 2.1

1. Translate into smooth English: $\forall x \forall y ((Px \wedge Ty \wedge Dxy \wedge Oxy) \rightarrow \neg \exists z (Pz \wedge Kzxy))$.

Let “Px” mean “x is a person”, “Tx” mean “x is a time”, “Dxy” mean “x is down at time y”, “Oxy” mean “x is out at time y”, and “Kxyz” mean “x knows y at time z”.

Every pair of individuals x and y is such that if x is a person, y is a time, x is down at time y, and x is out at time y, then there is no z such that if z is a person, z knows x at time y. More English-y: If someone is down and out, they cannot be known by someone else at that time. Even more English-y: Nobody knows you when you’re down and out.

For problems 2-15: Write a sentence in quantificational logic that captures as much of the given information as possible. Remember to delineate the extensions you assign to names and predicates.

2. All’s well that ends well. (Shakespeare) (B 148)

Ax: x is well

Bx: x ends well

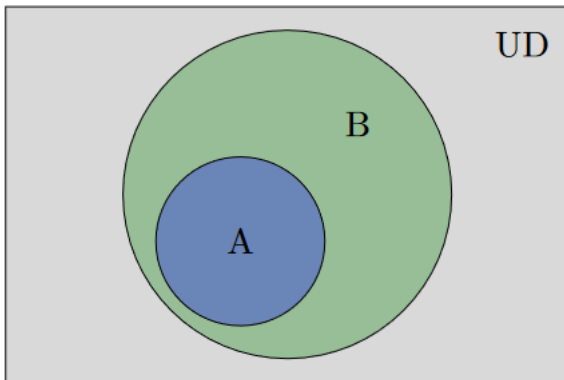
$\forall x (Bx \rightarrow Ax)$

3. The things which are seen are temporal; but the things which are not seen are eternal. (II Corinthians 4:18) (B 169)

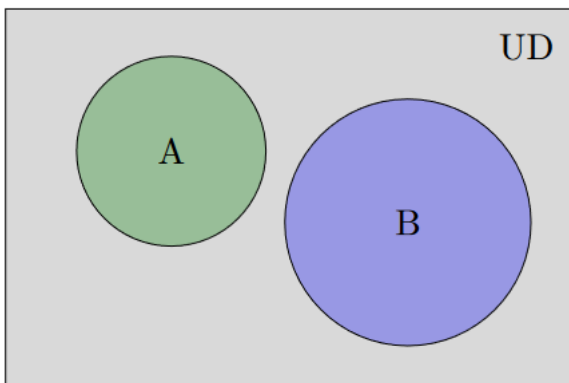
Ax: x is seen

Bx: x is eternal

$\forall x ((Ax \rightarrow \neg Bx) \wedge (\neg Ax \rightarrow Bx))$, which is equivalent to $\forall x (Ax \leftrightarrow \neg Bx)$.



4. Ax: x is in A
Bx: x is in B
 $\forall x (Ax \rightarrow Bx)$



5. Ax: x is in A
Bx: x is in B
 $\forall x (Ax \leftrightarrow \neg Bx)$ Update: this is wrong; this implies that if it’s not in B, it must be in A. The correct answer should be $A \rightarrow \neg B$ (and the implied contrapositive, $B \rightarrow \neg A$)

6. If you don’t love yourself, you can’t love anybody else.
Lxy: x loves y

- y: you
 $\neg Lyy \rightarrow \neg \exists x(Lyx)$
7. NSYNC is the best band ever.
 n: NSYNC
 A: is the best band
An Update: "best band" is exclusive.
 $An \wedge \neg \exists x(x \neq n \wedge Ax)$
8. Somebody loves everybody.
 Axy: x loves y
 $\exists x \forall y(Axy)$
9. There is someone for everybody.
 Axy: There is x for y
 $\forall y \exists x(Axy)$
Note: the order of quantifiers matters!
10. Scrooge doesn't love anybody.
 Axy: x loves y
 s: Scrooge
 $\neg \exists x(Lsx)$
11. Only the shallow know themselves. (Oscar Wilde) (B 169)
 Ax: x is shallow
 Bx: x knows itself
 $\forall x(Bx \rightarrow Ax)$
12. Everybody has a mother.
 Ax: x has a mother
 $\forall x(Ax)$
13. There are at least two pigs.
 Px: x is a pig
 $\exists x \exists y(Px \wedge Py \wedge (x \neq y))$
14. There are exactly two pigs.
 $\exists x \exists y \forall z(Px \wedge Py \wedge x \neq y \wedge ((z \neq x \wedge z \neq y) \rightarrow \neg Pz))$
15. There are at most two pigs.
 $\neg \exists x \exists y \exists z(Px \wedge Py \wedge Pz \wedge (x \neq y \wedge x \neq z \wedge y \neq z))$ (there are not 3 unique pigs)