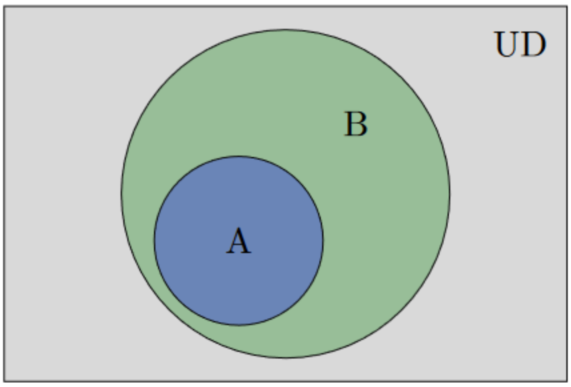
Submission 2.1

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

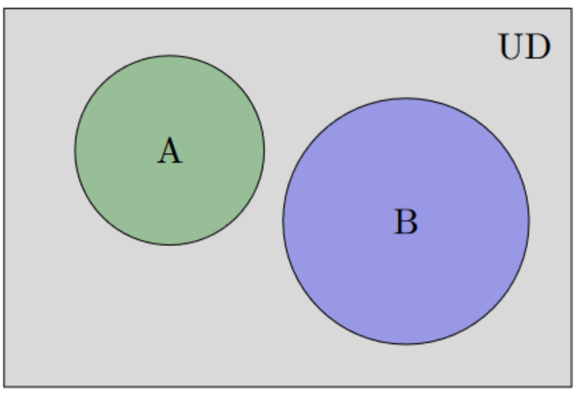
For problems 2-15: *Write a sentence in quantificational logic that captures as much of the given information as possible. Remember to delineate the extensions you assign to names and predicates.*

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
   $\forall x((Ax \rightarrow \neg Bx) \land (\neg Ax \rightarrow Bx))$, 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
   $\forall x(Ax \leftrightarrow \neg Bx)$

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

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.
    $\exists x \exists y \exists z (Px \wedge Py \wedge x \neq y \wedge ((z \neq x \wedge z \neq y) \rightarrow \neg Pz))$

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)*