Philosophy 500 — June 2 solutions

In some cases I provide more than one translation,
but there are others that would work too

Exercises without quantifiers

Using the key given, translate each of the following sentences:

Ax: x is an ant.
Bxy: x bartered with y.
Txy: x is taller than y.
Cx: Bill Clinton knows x.
a: Alex
b: Binky the Clown
c: Charles Barkley

1. Charles Barkley is an ant, but Alex isn't.
$Ac \,\&\, \neg Aa$
2. Bill Clinton knows Alex only if Charles Barkley bartered with y.
$Ca \rightarrow Bcy$
3. Bill Clinton knows Alex and Binky the Clown, both of whom are ants, but neither of which bartered with Charles Barkley.
$Ca \,\&\, Cb \,\&\, Aa \,\&\, Ab \,\&\, \neg Bac \,\&\, \neg Bbc$
4. Alex is shorter than Charles Barkley.
Tca
5. Alex and Binky the Clown are the same height.
$\neg Tab \,\&\, \neg Tba$
6. If x is an ant, then Bill Clinton knows it.
$Ax \rightarrow Cx$

Exercises with quantifiers

Translate the following sentences using this key:

UD: all animals

a: Alice

b: Betty

c: Chris

Ax: x is an ant
Bx: x is a bear
Rx: x is red
Lxy: x is larger than y.
Exy: x could eat y.

1. No bear could eat Alice.
   $\neg\exists x(Bx \,\&\, Exa)$
   $\forall x(Bx \rightarrow \neg Exa)$
2. Betty is larger than every ant.
   $\forall x(Ax \rightarrow Lbx)$
3. Some animals aren't ants.
   $\exists x(\neg Ax)$
   $\neg\forall x(Ax)$
4. Not every bear is red.
   $\neg\forall x(Bx \rightarrow Rx)$
   $\exists x(Bx \,\&\, \neg Rx)$
5. Not every animal is a red bear.
   $\neg\forall x(Rx \,\&\, Bx)$
   $\exists x(\neg(Rx \,\&\, Bx))$
6. Some ants are red.
   $\exists x(Ax \,\&\, Rx)$
7. Chris is an ant which every bear could eat.
   $Ac \,\&\, \forall x(Bx \rightarrow Exc)$
8. Every bear which is larger than Chris could eat Betty.
   $\forall x((Bx \,\&\, Lxc) \rightarrow Exb)$
   $\neg\exists x(Bx \,\&\, Lxc \,\&\, \neg Exb)$
9. Some red ants are larger than Alice.
   $\exists x(Ax \,\&\, Rx \,\&\, Lxa)$
10. Some red animal could eat Chris.
    $\exists x(Rx \,\&\, Exc)$
11. Not every red animal is an ant.
    $\neg\forall x(Rx \rightarrow Ax)$
    $\exists x(Rx \,\&\, \neg Ax)$
12. There are no red bears.
    $\neg\exists x(Rx \,\&\, Bx)$
    $\forall x(Rx \rightarrow \neg Bx)$
    $\forall x(Bx \rightarrow \neg Rx)$

UD: all animals

a: Alice

b: Betty

c: Chris

Ax: x is an ant
Bx: x is a bear
Rx: x is red
Lxy: x is larger than y.
Exy: x could eat y.

13. Every ant is either red or a bear.
    $\forall x(Ax \rightarrow (Rx \vee Bx))$
    $\neg\exists x(Ax \,\&\, \neg Rx \,\&\, \neg Bx)$
14. Chris is larger than every animal which he could eat.
    $\forall x(Ecx \rightarrow Lcx)$
15. No ant is larger than Chris, unless it's also a bear.
    $\neg\exists x(Ax \,\&\, Lxc \,\&\, \neg Bx)$
    $\forall x(Ax \rightarrow (\neg Lxc \vee Bx))$
16. Every red bear is either an ant or larger than Betty.
    $\forall x((Rx \,\&\, Bx) \rightarrow (Ax \vee Lxb))$
17. No ants are larger than Chris, who is a red bear.
    $Bc \,\&\, Rc \,\&\, \neg\exists x(Ax \,\&\, Lxc)$
18. There are no red ants which could eat Betty.
    $\neg\exists x(Rx \,\&\, Ax \,\&\, Exb)$
19. Every ant which isn't red could eat Chris.
    $\forall x((Ax \,\&\, \neg Rx) \rightarrow Exc)$
20. Every animal which is larger than Betty could be eaten by Chris.
    $\forall x(Lxb \rightarrow Ecx)$