1

(1)  a. \( \forall x(POSSUM(x) \rightarrow BROWN(x)) \)
    b. \( \exists x(SANDWICH(x) \& EAT(j, x)) \)
    or \( \exists x(EAT(j, x) \& SANDWICH(x)) \)
    c. \( \exists x(YOUNG(x) \& WOMAN(x) \& SPEAK(x)) \)
       (The conjuncts can be in any order.)
    d. \( \forall x(GAP(x) \rightarrow FILL(k, x)) \)
    e. \( \forall y(GUEST(y) \rightarrow THANK(y, j)) \)

(2)  a. \( \exists x(BLACK(x) \& HAT(x) \& ON(x, the bed)) \)
    b. \( \forall y(ROAD(y) \rightarrow LEAD(y, to Rome)) \)
    c. \( \forall x((TRAVELLER(x) \& FROM(x, s)) \rightarrow WELCOME(u, x)) \)
    d. \( \exists x(MURDER(x, c)) \)
    e. \( \forall y(BOOK(y) \& IN(y, the library)) \rightarrow READ(j, y)) \)
    f. \( \exists x(NASTY(x) \& IN(x, the woodshed) \& SEE(a, x)) \)
    g. \( \forall x(CLOUD(x) \rightarrow \exists y(SILVER LINING(y) \& HAVE(x, y)) \)

(3)  a. \( \forall x((PAINTING(x) \& FIND(b, x)) \rightarrow (CLEAN(j, x) \& FRAME(j, x)) \)
    b. \( \forall x(SPANIEL(x) \rightarrow (HEAVIER(c, x) \& MEANER(c, x)) \)
    c. \( \forall x(GENERATE(g, x) \leftrightarrow WELL-FORMED FORMULA(x)) \)
    d. \( \forall y(CHILD(y) \rightarrow (\exists x(BISCUIT(x) \& GIVE(c, x, y)) \lor \exists z(BATMAN COMIC(z) \& GIVE(c, z, x)) \& \sim (\exists w(BISCUIT(w) \& GIVE(c, w, y)) \& \sim (\exists u(BATMAN COMIC(u) \& GIVE(c, u, y))) \)
       or \( \forall y(CHILD(y) \rightarrow \exists x(BISCUIT(x) \lor BATMAN COMIC(x)) \& \sim (BISCUIT(x) \& BATMAN COMIC(x)) \& GIVE(c, x, y)) \)
       (There are other ways of doing this as well.)
    e. \( \forall x(DEATH NOTICE(x) \leftrightarrow READ(z, x)) \)
    f. \( \forall y((BUSINESS(y) \& \sim y = s) \rightarrow \sim LIKE(y, s)) \)
    or \( \sim \exists y((BUSINESS(y) \& \sim y = s \& LIKE(y, s)) \)
    g. \( \forall x(PERSON(x) \& LEAVE(x, the room)) \rightarrow EMPTY(the room) \)
    h. \( \exists x(PERSON(x) \& LEAVE(x, the cab)) \rightarrow PUT(j, the luggage, in the cab) \)
       (h = "If anyone leaves the cab ..."
        compare with "If a particular person leaves ..."
        j. \( \exists x(PERSON(x) \& (LEAVE(x, the cab) \rightarrow PUT(j, the luggage, in the cab)) \)

(4)  a. \( BIGGER(the small goat, the big spider) \)
    b. \( \exists x(COUNTERFEIT DOUBLOON(x) \& IN (x, the drawer)) \)
    c. \( \exists x(COLD TEA(x) \& POSS(j, x) \& \exists y(WARM BEER(y) \& POSS(h, y) \& WARMER(x, y))) \)

(5)  a. \( \sim \forall x(PERSON(x) \rightarrow LIKE(x, b)) \)
    or \( \exists x(PERSON(x) \& \sim LIKE(x, b)) \)
    b. \( \sim \exists x(PERSON(x) \& LIKE(b, x)) \)
    or \( \forall x(PERSON(x) \rightarrow \sim LIKE(b, x)) \)
(6) a. There are two main intonation patterns with the main stress on everyone. On the first intonation, the pitch of the last two syllables is the lowest pitch in the utterance, and the pitch (roughly) runs downwards throughout the utterance. This most saliently means that Bob dislikes everyone, or doesn't like anyone:

$$\forall x (\text{PERSON}(x) \rightarrow \neg \text{LIKE}(b, x))$$

or

$$\neg \exists x (\text{PERSON}(x) \land \text{LIKE}(b, x))$$

On the second intonation the pitch on ev is the highest in the utterance, and the pitch on the last two syllables is about the middle pitch for the utterance. This means that it isn't the case that Bob likes everyone – there is at least one person that Bob doesn't like:

$$\neg \forall x (\text{PERSON}(x) \rightarrow \text{LIKE}(b, x))$$

or

$$\exists x (\text{PERSON}(x) \land \neg \text{LIKE}(b, x))$$

b. One pattern has the main stress on Bob and the pitch running downwards throughout the utterance. This means that everyone dislikes Bob:

$$\forall x (\text{PERSON}(x) \rightarrow \neg \text{LIKE}(x, b))$$

or

$$\neg \exists x (\text{PERSON}(x) \land \text{LIKE}(x, b))$$

The second pattern has a high pitch and main stress on ev and a middling pitch on Bob. This means that it isn't the case that everyone likes Bob – there is at least one person who doesn't like Bob:

$$\neg \forall x (\text{PERSON}(x) \rightarrow \text{LIKE}(x, b))$$

or

$$\exists x (\text{PERSON}(x) \land \neg \text{LIKE}(x, b))$$

(7) a. **Every prize was won by some high school kid.**

(i) "For every prize, the winner was a high school kid" (possibly different kids)

$$\forall x (\text{PRIZE}(x) \rightarrow \exists y (\text{HIGH SCHOOL KID}(y) \land \text{WIN}(y, x)))$$
(ii) "A particular high school kid won all the prizes"
    \[ \exists x (\text{HIGH SCHOOL KID}(x) \land \forall y (\text{PRIZE}(y) \rightarrow \text{WIN}(x, y))) \]

b. Someone had scribbled on every wall in the kitchen.
   Treat scribble on as a predicate (compare Chapter 2, Ex. 17.)
   (i) "Every wall was scribbled on – could be by different people”.
       \[ \forall x (\text{WALL}(x) \rightarrow \exists y (\text{PERSON}(y) \land \text{SCRIBBLE ON}(y, x))) \]

   (ii) "A particular person had scribbled on every wall.”
       \[ \exists x (\text{PERSON}(x) \land \forall y (\text{WALL}(y) \rightarrow \text{SCRIBBLE ON}(x, y))) \]

3
c. Every cheerleader had shared a milkshake with Jones.

(i) "An enormous milkshake was shared among Jones and all the cheerleaders."

\[ \exists x (\text{MILKSHAKE}(x) \land \forall y (\text{CHEERLEADER}(y) \rightarrow \text{SHARE}(y, x, j))) \]

(ii) "For each cheerleader, there was a milkshake which she shared with Jones – possibly different milkshakes."

\[ \forall x (\text{CHEERLEADER}(x) \rightarrow \exists y (\text{MILKSHAKE}(y) \land \text{SHARE}(x, y, j))) \]