Homework Translation Practice Solution

1. Rudi likes cheese.

   - For all x, if x is cheese, then Rudi likes x.
     - $\forall x (Cx \rightarrow Lrx)$

2. Rudi likes cheese and nuts.

   - For all x, if x is a cheese or x is a nut, then Rudy likes x.
     - $\forall x ((Cx \vee Nx) \rightarrow Lrx)$

   - For all x, if x is cheese then Rudy likes x and for all x, if x is a nut then Rudy likes x.
     - $\forall x (Cx \rightarrow Lrx) \& \forall x (Cx \rightarrow Lrx)$

3. Rudi makes cheese.

   - For all x, if x is cheese then Rudi makes x.
     - $\forall x (Cx \rightarrow Mrx)$

4. Rudi loves cheese.

Same as 1.

5. Some cheese is tasty.

   - There is an x such that it is cheese and it is tasty.
     - $\exists x (Cx \& Tx)$

6. Some cheese is smelly.

   - There is an x such that it is cheese and it is smelly.
     - $\exists x (Cx \& Sx)$

7. No smelly cheese is tasty.

   - For all x, if x is smelly and x is cheese, then it is not tasty.
     - $\forall x ((Sx \& Cx) \rightarrow \neg Tx)$
   - There is no x that is smelly and cheese and tasty.
     - $\neg \exists x((Sx \& Cx) \& Tx)$

8. Rebecca like smelly cheese.

- For all x, if it is smelly and cheese, then Rebecca likes it.
  - $\forall x ((Sx \& Cx) \rightarrow Lrx)$

9. Everyone likes at least one cheese.
   - For all persons x there exists at least one y such that y is cheese and x likes y.
     - $\forall x \exists y(Px \rightarrow (Cy \& Lxy))$
     - $\forall x (Px \rightarrow \exists y(Cy \& Lxy))$

10. Some people like all cheese.

- There exists an x such that x is person and for all y if y is a cheese, then x like y.
  - $\exists x(Px \& \forall y(Cy \rightarrow Lxy))$
  - $\exists x \forall y(Px \& (Cy \rightarrow Lxy))$

11. Sam likes no cheese that is not grated.

- For all x, if x is a cheese and x is not grated, then Sam does not like x.
  - $\forall x ((Cx \ \& \neg Gx) \rightarrow \neg Lsx)$
- It is not the case that there exists an x such that x is a cheese and x is not grated and Sam likes x.
  - $\neg \exists x((Cx \& \neg Gx) \& Lsx)$

12. Sam doesn't make any smelly cheeses.

- For all x , if x is a cheese and x is smelly, then Sam does not make x.
  - $\forall x((Cx \& Sx) \rightarrow \neg Msx)$
- It is not the case that x is a cheese and x is smelly and Sam makes x.
  - $\neg \exists x ((Cx \& Sx) \& Msx)$

13. Sam buys cheese and sells cheese, but he doesn't make cheese.

This one is a little ambiguous. You can interpret as meaning that Sam buys all cheese but he doesn't make any cheese. Or you can interpret as meaning Sam buys some cheese but doesn't make any cheese. The latter seems a bit more reasonable.

There exists an x such that x is a cheese and Sam buys x, and for all y if y is cheese then Sam does not make y.

- $\exists x(Cx \ \& \ Bsx) \ \& \ \forall y(Cy \rightarrow \neg Msy)$
- $\exists x \forall y((Cx \ \& \ Bsx) \ \& \ (Cy \rightarrow \neg Msy))$

14. If gorgonzola is better than cheddar and cheddar is better than brie, then gorgonzola is better than both cheddar and brie.

For all x, y, an z, if x is gorgonzola and y is cheddar and z is brie, and x is better than y and y is better than z, then x is better than z.

Let T stand for "better than"

- $\forall x \forall y \forall x$ ((((Gx & Cy) & Bz) &(Txy & Tyz)) $\rightarrow$ Txz)

15. Cheese and wine go well together.

For all x and for all y, if x is cheese and y is wine then x goes well with y and y goes well with x.

Let G stand for "goes well with"

- $\forall x \forall y((Cx \ \& \ Wy) \rightarrow (Gxy \ \& \ Gyx))$

16. If the cheese in the refrigerator is moldy, don't eat it.

For all x and for all y and for all z if x is cheese and moldy and y is the refrigerator and x is in y, then it is not the case that z eats x.

I= in E = eats

- $\forall x \forall y \forall z((Cx \ \& \ Mx) \ \& \ (Ry \ \& \ Ixy)) \rightarrow (Pz \rightarrow \neg \ Ezy))$

17. Someone ate moldy cheese and died.

There is an x and a y such that x is moldy and x is cheese and y is a person and y ate x and y died.

- $\exists x \exists y((Mx \ \& \ Cx) \ \&(Py \ \& \ Ayx)) \ \& \ Dy)$

18. Anyone who eats moldy cheese is starving.

For all x and for all y, if x is a person and y is moldy and cheese, and x eats y, then x is starving.

- $\forall x \forall y \ ((Px \ \& \ (My \ \& \ (Cy \ \& \ Exy))) \rightarrow Sx)$

19. Anyone who does not like cheese has not tried cheese.

For all x and for all y, if x is a person and x is cheese and x does not like y, then x has not tried y.

- $\forall x \forall y(((Px \ \& \ Cy) \ \& \ \neg Lxy) \rightarrow \neg \ Txy)$

20. There is someone in this room who does not eat moldy cheese.

Actually, this one can't be easily captured by predicate logic because of the adjective 'this'. We can make it easier by substituting the word "a" for "this".

There is an x and there is a y such that x is a person and y is a room and x is in y and for all z, if z is moldy and z is cheese, than x does not eat z.

- $\exists x \exists y(((Px \ \& \ Ry) \ \& \ Ixy) \ \& \ \forall z((Cz \ \& \ Mz) \rightarrow \neg Exz))$