Translation

David Sanson — 112 — 27 Feb 2020

1 From Symbols to English

Chapter 9 offers a procedure for going from symbols to English without introducing ambiguity. I would like to suggest a slightly different procedure

Here is the procedure, slightly modified from the procedure described at the beginning of Chapter 9:

1. If the sentence to be translated is in unofficial notation, then restore any parentheses that would be there if the sentence were in official notation.
2. Locate the main connective of the formal sentence.
3. If the main connective is $\rightarrow$, so that the sentence is $(\square \rightarrow \bigcirc)$, then write "(If $\square$, then $\bigcirc$)".
4. If the main connective is $\wedge$, so that the sentence is $(\square \wedge \bigcirc)$, then write "(it's both the case that $\square$ and that $\bigcirc$)".
5. If the main connective is $\vee$, so that the sentence is $(\square \vee \bigcirc)$, then write "(either $\square$ or $\bigcirc$)"
6. If the main connective is $\leftrightarrow$ so that the sentence is $(\square \leftrightarrow \bigcirc)$, then write "($\square$ if and only if $\bigcirc$)"
7. If the main connective is $\neg$, so that the sentence is $\neg\square$, then write "It is not the case that $\square$."
8. If there's no main connective, and you have only a sentence letter, replace the letter with its English meaning according to the scheme of translation.
9. Apply this procedure to each of the sub-formulas of the target sentence.

This differs in two ways from the book. First, the book has you remove parentheses as you go, but I'd like you to keep them. Second (and for related reasons) the book offers a more complicated way of expressing "if and only if", meant to avoid ambiguity without needing parentheses.

P = I win. Q = I compete. R = I lose. S = I have a good time. T = We tie.

1. $P \vee R$
2. $\neg(P \vee R)$
3. $\neg P \wedge \neg R$
4. $P \vee R \rightarrow \neg T$
5. $T \rightarrow \neg(P \vee R)$
6. $S \leftrightarrow P$
7. $P \vee R \leftrightarrow Q \wedge \neg T$
8. $\neg(R \wedge S)$
9. $\neg R \wedge \neg S$
10. $\neg R \vee \neg S$
11. $Q \wedge P \rightarrow S$
12. $Q \wedge R \rightarrow \neg S$
13. $\neg(Q \wedge R \rightarrow \neg S)$
14. $Q \vee R \rightarrow Q \wedge S$

2 From English to Symbols

2.1 Helper Words and Ambiguity

Our canonical expressions of $->$, $\wedge$ and or involve two words that work together:

$P \rightarrow Q$	If P then Q
$P \vee Q$	Either P or Q
$P \wedge Q$	Both P and Q

In each case, we can drop the "helper" word ("then", "either", "both"), and the result is still good English:

$P \rightarrow Q$	If P Q
$P \vee Q$	P or Q
$P \wedge Q$	P and Q

But when we drop the helper words, this can lead to ambiguity:

1. It is not the case that ~~either~~ P or Q
2. ~~Either~~ P or ~~both~~ Q and R.

Each of the following is ambiguous. What are the different possible symbolizations? How can you express each reading, in English, unambiguously?

3. I win and I have a good time or I lose.
4. I win or I have a good time and I lose.
5. I lose or we tie if I have a good time.
6. If I compete I win or I lose.
7. It is not the case that I win if I compete.
8. It is not the case that I win or I lose.

2.2 Neither. . . nor

Neither P nor Q $\neg(P \vee Q)$

9. I neither win nor lose.

2.3 Stylistic Variants

Come up with your own symbolization key and symbolize the following. If they are ambiguous, provide all the readings:

10. It was hard but she persevered.
11. She persevered despite the fact that it was hard.
12. ISU does not cancel classes unless it snows.
13. You win just in case I lose.
14. It was hard but she persevered unless she gave up even though it was easy.

2.4 Complex Subjects and Predicates

P: Jack ran up the hill. Q: Jill ran up the hill. R: Jack fell down the hill. S: Jill fell down the hill.

15. Jack and Jill ran up the hill.
16. Jack ran up and fell down the hill.
17. Jill ran up or fell down the hill.
18. Neither Jack nor Jill ran up the hill.
19. Jack neither ran up nor fell down the hill.

Complex subjects and predicates often help disambiguate: a sentence with a complex subject or predicate acts as a unit, when combined with other sentences using our connectives:

20. Jill neither ran up nor fell down the hill, but Jack ran up and fell down the hill.
21. Jack and Jill ran up the hill just in case Jack and Jill fell down the hill.
22. Jack and Jill didn't fall down the hill unless they both ran up the hill.

P: Fido is petted. Q: Fido growls. R: Tibbles is petted. S: Tibbles scratches.

23. If Fido or Tibbles are petted, Fido growls or Tibbles scratches.
24. Fido growls if petted but Tibbles scratches only if petted.

2.5 Non-Restrictive Relative Clauses

T: Dogs often bark. U: Dogs often misbehave.

25. Dogs often bark and dogs often misbehave.
26. Dogs, who often bark, often misbehave.
27. Dogs who often bark often misbehave. (We can't handle this one!)