

Transcription Strategies

Quasi-English

- A general strategy for transcribing complex sentences of English into Predicate Logic is to replace in steps English words with Predicate Logic symbols.
- “Transcribe parts into logic, writing down things which are part logic and part English. Bit by bit, transcribe the parts still in English into logic until all the English is gone” (p. 54).
- Expressions which contain both English and Predicate Logic symbols may be said to be written in “Quasi-English”.

An Example

- Any boy who loves Eve is not a furry cat.
- We might look at the sentence as a universal conditional of the form $(\forall \mathbf{u})(\mathbf{P}(\mathbf{u}) \supset \mathbf{Q}(\mathbf{u}))$.
- $(\forall x)(x \text{ is a boy who loves Eve} \supset x \text{ is not a furry cat})$.
- x is a boy who loves Eve: $Bx \ \& \ Lxe$.
- $(\forall x)((Bx \ \& \ Lxe) \supset x \text{ is not a furry cat})$.
- x is not a furry cat: $\sim(Fx \ \& \ Cx)$.
- $(\forall x)((Bx \ \& \ Lxe) \supset \sim(Fx \ \& \ Cx))$.

Open Sentences and Restricted Quantifiers

- Any boy who loves Eve is not a furry cat.
- We can proceed in the same way as before, to a point where we can use a different technique.
- $(\forall x)(x \text{ is a boy who loves Eve} \supset x \text{ is not a furry cat})$.
- x is a boy who loves Eve: $Bx \ \& \ Lxe$.
- The open sentence of Predicate Logic can be thought of as “a complex one place predicate”, though its form is that of a compound sentence.
- As a predicate, it can be used to restrict the quantifier.
- $(\forall x)_{(Bx \ \& \ Lxe)}(x \text{ is not a furry cat})$.
- x is not a furry cat: $\sim(Fx \ \& \ Cx)$.
- $(\forall x)_{(Bx \ \& \ Lxe)} \sim(Fx \ \& \ Cx)$.

Extending the Technique of Restricted Quantifiers

- In the previous example, we could treat ‘Be & Lxe’ as a one-place predicate because it contains only a single free variable, since one argument of the two-place predicate ‘L’ is the name ‘Eve’.
- Some English relational expressions such as ‘is married’ or ‘has a tail’ also can be symbolized as one-place predicates, despite the absence of names in them.
- To say that x is married is to say that x has a spouse, transcribed as ‘ $(\exists y)Mxy$ ’, which has only one free variable.
- This complex predicate can then be treated as a one-place predicate (or part of one) for the purposes of restricting quantifiers.
 - Anyone who is married had a wedding.
 - $(\forall x)_{(Px \& (\exists y)Mxy)} Wx$.

Removing the Restrictions

- Once we have transcribed a sentence with a quantifier restriction, we can convert it automatically into a sentence without one.
 - $(\forall x)_{(Px \& (\exists y)Mxy)} Wx$.
 - $(\forall x)((Px \& (\exists y)Mxy) \supset Wx)$.

This technique works as well in the case of iterated quantifiers.

- Some cat owner loves everyone who loves themselves.
- $(\exists x)_{(x \text{ is a cat owner})} (x \text{ loves everyone who loves themselves})$.
- x is a cat owner: $(\exists y)(Cy \& Oxy)$.
- $(\exists x)_{(\exists y)(Cy \& Oxy)} (x \text{ loves everyone who loves themselves})$.
- x loves everyone who loves themselves: $(\forall y)_{(Py \& Lyy)} Lxy$.
- $(\exists x)_{(\exists y)(Cy \& Oxy)} [(\forall y)_{(Py \& Lyy)} Lxy]$.
- $(\exists x)[(\exists y)(Cy \& Oxy) \& (\forall y)_{(Py \& Lyy)} Lxy]$.
- $(\exists x)[(\exists y)(Cy \& Oxy) \& (\forall y)((Py \& Lyy) \supset Lxy)]$.

Error-Checking

- A good way to check for errors in transcription is to transcribe the sentence of Predicate Logic back into English.
- One example is a sentence of Predicate Logic with an existential quantifier governing a conditional.
 - If something is a cat, it is not a dog.

– $(\exists x)(Cx \supset \sim Dx)$.

– There is something such that if it is a cat, then it is not a dog.

- Another example is one in which a conjunctive subject is treated as expressing a complex predicate.

– Cats and dogs have tails.

– $(\forall x)((Cx \ \& \ Dx) \supset (\exists y)Tyx)$.

– Everything that is both a cat and a dog has a tail.