6.1.5. Analyzing predications

In our symbolic notation for predications of non-logical predicates—that is, for the predications that are not equations—the predicate will come first followed by the individual terms that are its input. When the predicate is expressed by an abstract, it will be enclosed in square brackets, so we might begin an analysis of *Bill told Ann about himself* as follows:

	Bill told Ann about himself
Identify (referentially transparent) occurrences of individual terms within the sentence, making sure they are all independent by replacing pronouns by their antecedents	<u>*Bill*</u> *told* <u>*Ann*</u> *about* <u>*Bill*</u>
Separate the terms from the rest of the sentence	*Bill* *Ann* *Bill* ___ *told* ___ *about* ___
Preserve the order of the terms, and establish the order of the places of the predicate by putting distinct variables in the blanks left by the terms and applying a lambda operator for these variables	λxyz (x *told* y *about* z) *Bill Ann Bill*
Surround the predicate abstract with brackets to predicate it, forming a sentence with blanks at the end	*Bill Ann Bill* [λxyz (x *told* y *about* z)] ___ ___ ___
Write the terms in the places of the predicate abstract	[λxyz (x *told* y *about* z)] <u>*Bill*</u> <u>*Ann*</u> <u>*Bill*</u>

Underlining will often be used, as it is here, to mark the places of predicates when they are filled by English expressions.

In examples and answers to exercises, we will move directly from the second of these steps to the last, so the process can be thought of as one of removing terms, placing them (in order and with any repetitions) after the sentence they are removed from, and filling the blanks left in that sentence with distinct variables, applying a corresponding lambda operator and surrounding it with brackets.

In general, an application of an n-place predicate θ to a series of n individual terms $\tau_1, ..., \tau_n$ takes the form

$$\theta\tau_1 \ldots \tau_n$$

and our English notation is this:

$$\theta \ \texttt{fits} \ \tau_1, \ldots, \ \texttt{'n} \ \tau_n$$

The use of the verb *fit* here is somewhat artificial. It provides a short verb that enables $\theta\tau_1 \ldots \tau_n$ to be read as a sentence, and it is not too hard to understand it as saying that θ is true of $\tau_1, \ldots, \tau_n$. Another artificial aspect of this notation is the unemphasized form `'n`, which is designed to distinguish the use of *and* here to join the terms of a relation from its use as a truth-functional connective. We will use the general notation $\theta\tau_1 \ldots \tau_n$ when we wish to speak of all predications, so we will take it to apply to equations, too, even though the predicate = is written between the two terms to which it is applied.

In our fully symbolic analyses, unanalyzed non-logical predicates will be abbreviated by capital letters. This is consistent with our use of capital letters for unanalyzed sentences and with the idea that such a sentence amounts to a zero-place predicate. (When we add non-logical operations that yield individual terms as output, they will be abbreviated by lower case letters just as unanalyzed individual terms are.)

As was down in the display above, we will use the Greek letters θ, π, and ρ to refer to stand for any predicates, so they may stand for single letters, abstracts, or =. For the time being, all terms will be single letters in our symbolic notation; but in the next section we will consider compound terms, so we will use the Greek letters τ, σ, and υ to stand for any terms, simple or compound.

If we continue the analysis of *Bill told Ann about himself* into fully symbolic form, we would get the following:

Bill told Ann about himself

Bill *told* *Ann* *about* *Bill*

[λxyz (x *told* y *about* z)] *Bill* *Ann* *Bill*

Tbab

T `fits` b, a, `'n` b

[T: λxyz (x *told* y *about* z); a: *Ann*; b: *Bill*]

The abstract does not appear in the final analysis but it does appear in the key. The entry

T: λxyz (x *told* y *about* z)

in the key identifies T as a predicate that, when applied to terms σ, τ, υ (in that order) yields as output the sentence σ *told* τ *about* υ.

When sentences contain truth-functional structure, that structure should be analyzed first; an analysis into predicates and individual terms should begin only when no further analysis by connectives is possible. Here is an example:

If either Ann or Bill was at the meeting, then Carol has seen the report and will call you about it
Either Ann or Bill was at the meeting → *Carol has seen the report and will call you about it*
(*Ann was at the meeting* ∨ *Bill was at the meeting*) → (*Carol has seen the report* ∧ *Carol will call you about the report*)
([λxy (x *was at* y)] *Ann the meeting* ∨ [λxy (x *was at* y)] *Bill the meeting*) → ([λxy (x *has seen* y)] *Carol the report* ∧ [λxyz (x *will call* y *about* z)]*Carol you the report*)

(Aam ∨ Abm) → (Scr ∧ Lcor)

`if` `either` A `fits` a `’n` m `or` A `fits` b `’n` m `then` `both` S `fits` c `’n` r `and` L `fits` c, o, `’n` r

[A: λxy (x *was at* y); L: λxyz (x *will call* y *about* z); S: λxy (x *has seen* y); a: *Ann*; b: *Bill*; c: *Carol*; m: *the meeting*; o: *you*; r: *the report*]

When analyzing atomic sentences into predicates and terms be sure to watch for repetitions of predicates from one atomic sentence to another; such repetitions are an important part of the logical structure of the sentence.

Since the notation for identity is different from that used for non-logical predicates, you need to watch for atomic sentences that count as equations. These will usually, but not always, be marked by some form of the verb *to be* but, of course, forms of *to be* have other uses, too. Consider the following example:

If Tom was told of the nomination, then if he was the winner he wasn’t surprised
Tom was told of the nomination → *if Tom was the winner he wasn’t surprised*

Tom was told of the nomination → (*Tom was the winner*
→ *Tom wasn't surprised*)

Tom was told of the nomination → (*Tom was the winner*
→ ¬ *Tom was surprised*)

[λxy (x *was told of* y)] *Tom the nomination*
→ (*Tom* = *the winner* → ¬ [λx (x *was surprised*)] *Tom*)

Ltn → (t = r → ¬ St)

`if` L `fits` t `'n` n `then` `if` t `is` r `then` `not` S `fits` t

[L: λxy (x *was told of* y); S: λx (x *was surprised*); t: *Tom*;
n: *the nomination*]

It is fairly safe to assume that a form of *to be* joining to individual terms indicates an equation, but it is wise to always think about what is being said: an equation is a sentence that says its component individual terms have the same reference value. Notice also that identity does not appear in the key to the analysis. That is because it is part of the logical vocabulary; that is, it is like the connectives, which also do not appear in keys.