

### 3.9. Main Form Phrase, Main Connective

**1. Deceptively Similar Sentences.** We have so far restricted our attention to English sentences with a single form phrase – or at most repetition of the same sort of phrase several times over (a triple-barreled English conjunction, for instance). That much form poses no translation challenge deeper than finding the phrases in a look-up list. But once different types of English form – negation, conjunction, and disjunction phrases – are mixed together within the same sentence, we find ourselves in the deep end of the pool.

To cite one example: in our earliest discussion of logical form we referred to negations informally as “‘not’ sentences”. But the ancient Stoic logicians – pioneers in this sort of logic – already recognized the limits in thinking of a negation simply as ‘a sentence containing “not”’. For we can add “not” (or one of its variations) to a sentence without getting the negation of that sentence.

Stoics define ‘contradictories’ as pair of sentences where one exceeds the other by a negative – e.g., “It is day,” “It is not day”. But consider this pair: “It is day and night,” “It is day and not night”; the second exceeds the first by a negative, but they’re not contradictories. But they say: they will be contradictories if the negative is prefixed to the proposition, for then it will have “scope” over [*kurieuei*, governs over] the whole proposition – whereas in “It is day and not night” the negative does not have sufficient scope to negate the whole proposition. But then they should change their definition of “contradictory” to include this point. (Sextus Empiricus, quoted in Mates 1961: 97)

That problem is illustrated in the following similar-looking pair of sentences.

- (1) We won’t have **both** cake **and** champagne.
- (2) We won’t have cake, **but** we’ll have champagne.

Recalling that in our catalogue of translation variations we treat “but” as the equivalent of “both... and,” we view both of these sentences as containing a negation and a conjunction phrase. And since both sentences string together the same subject matter sentences – “We’ll have ice cream” and “We’ll have

cake” – we see that (1) and (2) are built from all the same logical parts, appearing in the same order.

- (1) We won’t have *both* cake *and* champagne.
- (2) We won’t have cake, but we’ll have champagne.

Yet intuitively the two sentences stake quite different claims. For instance, they score very differently on the ‘cake test’: does this sentence, if true, rule out our having cake? Sentence (2) certainly rules out cake. But Sentence (1) doesn’t: consistent with (1), we might well have cake (though in that case we wouldn’t *also* have champagne). For fans of cake, the difference between (1) and (2) is clear enough.

But the point should be just as clear – and just as important – to anyone concerned with validity. For Sentence (2) validly entails that *we won’t have cake*, while Sentence (1) does not. That is: Argument (B) is valid, while Argument (A) is invalid.

### Argument A

(1) We won’t have *both* cake *and* champagne.

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∴ We won’t have cake.

**INVALID**

### Argument B

(2) We’re won’t have cake, but we’ll have champagne.

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∴ We won’t have cake.

**VALID**

Against the validity of Argument (A), consider again the situation where we have cake but no champagne. That’s a case where the premise (Sentence 1) is true, while the conclusion is false – a validity counterexample for Argument (A). The difference between Sentences (1) and (2) is thus a difference that *makes* a difference to validity.

**2. The Main Form Phrase.** The fact that Arguments (A) and (B) are built from the same material, in the same order – a negation phrase, a subject matter sentence, conjunction phrase, second subject matter sentence – should be worrying. For we’ve assumed that only logical form makes a differences to validity; but so far the two sentences seem to have the same logical form. If we’re going to preserve our guiding assumption that only form matters to

validity, then we need to find some difference in form between Argument (A) and Argument (B).

Intuitively, the difference is that Sentences (1) and (2) are different types of sentences. Sentence (2) is a **conjunction**, asserting two smaller claims: (a) that *we won’t have cake*, and (b) that *we’ll have champagne*.

(2) We won’t have cake, but we’ll have champagne.

Sentence (1), by contrast, is a **denial**: (1) denies the claim that *we’ll have both ice cream and champagne*. That makes Sentence (1) a **negation**.

(1) We won’t have *both* cake *and* champagne.

And what follows validly from each sentence depends crucially on what *kind* of sentence it is. In particular: one of our earliest examples of a valid logical form was a conjunction entailing its left part.<sup>1</sup>

$$\frac{\bullet \text{ and } \blacktriangle}{(\text{So,}) \bullet}$$

That explains why Sentence (2) validly entails the conclusion “We won’t have cake”: Sentence (2) is a conjunction, and the conclusion is just the left part of that conjunction.

But while all that makes sense, it seems we’ve only pushed the mystery back a step. For when told that (1) is a negation while (2) is a conjunction, we can fairly ask: given that both sentences are built out of a conjunction phrase, a negation phrase, and the same two subject matter sentences, how do they wind up with different logical forms?

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<sup>1</sup> In 3.1, *Formal Logic: The Philosophy*

Informally, we will say that in each sentence one of the two form phrases acts as the **main form phrase** of the whole sentence, determining what kind of sentence it is. In Sentence (2) the conjunction phrase “but” acts as the main form phrase of the sentence – making (2) a conjunction.

(2) We won’t have cake, **but** we’ll have champagne.

The main form phrase of Sentence (1) is instead the negation phrase “n’t,” making (1) a negation.

(1) We won’t have *both* cake *and* champagne.

And what determines which form phrase acts as the *main* form phrase of the sentence? Answering that question returns us to sentence construction – and to the formal language.

**3. The Main Connective.** Consider the formal translation of Sentence (1). We’re reading Sentence (1) as a denial – specifically, a denial of a “both... and” claim. To translate Sentence (1) into the formal language, we first translate that “both” claim, using the following translation table.

**P:** We will have cake.

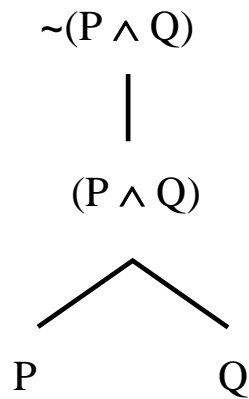
**Q:** We will have champagne.

**We’ll have both cake and champagne** (P ∧ Q)

For the denial of that formal sentence we then just attach a tilde to the left.

(1) We won’t have both cake and champagne (1F) ~ (P ∧ Q)

The **construction** of Sentence (1F) follows exactly those steps: first adding a wedge (with parentheses), then a tilde.

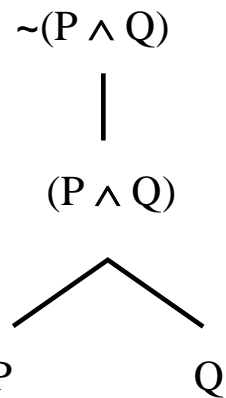
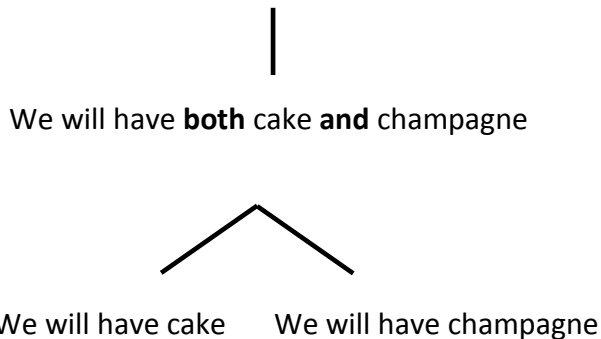


It’s no mystery why the tilde is the **main** connective here, making the whole sentence a negation: the tilde is **the last connective added** in construction. In fact that serves as our definition of the “main connective” of a formal sentence.

The **main connective** of a formal sentence is the last connective added in the construction of that sentence.

But then, reading the construction of Sentence (1) as parallel to its formal translation, “n’t” is the last form phrase added in its construction.

(1) We won’t have both cake and champagne

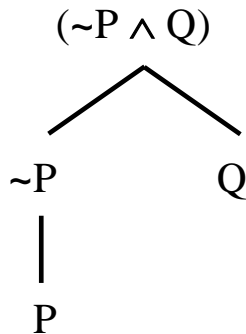


Assuming a parallel construction process explains why “n’t” is the **main form phrase** of Sentence (1).

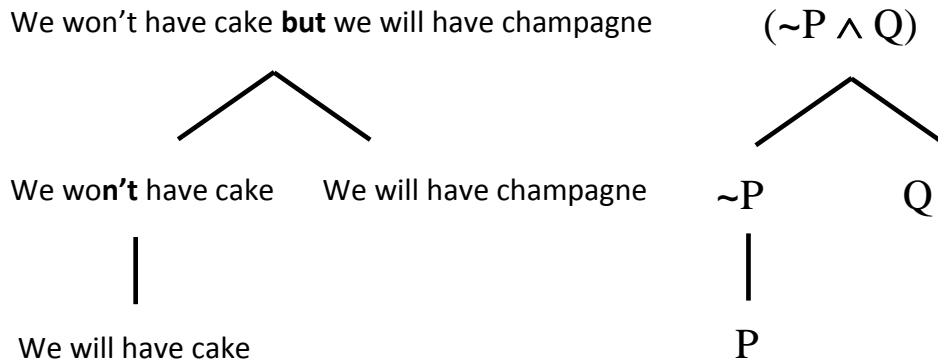
Using the same translation table, we translate Sentence (2) as a conjunction – a conjunction whose left part contains a negation phrase.

**(2) We won't have cake, but we'll have champagne (2F) ( $\sim P \wedge Q$ )**

Construction of that formal sentence follows those steps: first constructing “ $\sim P$ ,” then ‘wedging’ it together with “ $Q$ ”.



And once again, reading the English original (Sentence 2) as following the same construction steps resolves any mystery about its main form phrase. Just as wedge is the **main connective** of “( $\sim P \wedge Q$ )” because the wedge is added last in construction, so likewise “but” is the **main form phrase** of (2).



Thus construction, far from being a mere formal amusement, is central to which connective is the *main* connective of the sentence; and as we've noted, that makes a crucial difference to argument validity. Just as with their

English counterparts, Formal Argument A is valid while Formal Argument B is not.

Formal Argument A	Formal Argument B
$\begin{array}{c} \text{(F2)} \quad (\sim P \wedge Q) \\ \hline \therefore \sim P \end{array}$	$\begin{array}{c} \text{(F1)} \quad \sim(P \wedge Q) \\ \hline \therefore \sim P \end{array}$
<b>VALID</b>	<b>INVALID</b>

And note: the only formal difference between these two arguments is the placement of the left parenthesis. Our earlier insistence on parentheses likewise proves to be more than a grammatical obsession; for we see now that shifting a parenthesis just one space to the left or right can spell the difference between validity and invalidity.

That’s why the formal language counts the following as a bogus piece of gibberish.

$$(3) \sim P \wedge Q$$

Without parentheses, it’s not clear whether (3) is a conjunction or a negation. And for reasons just rehearsed, that makes all the difference in the world to logic.

**4. English Clues.** Appreciating the importance of getting the main connective right in formal translation, we list some English clues to this end.

**First**, “either” in “either... or” and “both” in “both... and” function like the **left parenthesis** does in Formalese, marking the left-most border of the sentence. While “either” and “both” are optional, their presence can settle matters when an “or” or “and” is competing with a negation phrase to be main connective.

So in Sentence (4), “either” wraps outside “not” – just as the left parenthesis outflanks the tilde in formal Sentence (4F).

(4) [**Either** we’re not having ice cream, or we’re having cake] (4F)  $(\sim P \vee Q)$

But in Sentence (5) “not” attaches to the left of (hence *outside* of) “either,” just as the tilde does with the left parenthesis in (5F) – making both sentences negations.

(5) **It’s not the case that** we’re having [either ice cream or cake] (5F)  $\sim(P \vee Q)$

In fact the same English clue was at work back in Sentence (2): since “n’t” is attached outside of “both” – and hence must have been added in a construction step *after* “both... and” – that “n’t” serves as the main form phrase of (2). That’s what made it clear that (2) is a negation.

(2) We won’t have [both ice cream and cake] (2F)  $\sim(P \wedge Q)$

And when **inversion** moves a form phrase to the left in an English sentence, that moved phrase likewise acts as a left parenthesis. So in Sentence (6) the negation phrase applies to the entire “unless” sentence that follows; while in (7) the negation phrase is tucked into the left half of the larger sentence.

P: Neko’s asleep  
Q: Neko’s hungry

(6) It’s not the case that [**unless** Neko’s asleep she’s hungry].  
(6F)  $\sim(P \vee Q)$

(7) It’s not the case that Neko’s asleep, unless she’s hungry].  
(7F)  $(\sim P \vee Q)$

**Second**, in a duel for dominance between two-place form phrases – e.g., a conjunction and a disjunction phrase – the **comma** is very often the crucial English clue.

For the main form phrase of the sentence marks the biggest *break* in the sentence (the gap coming between the sentences getting glued together). And the comma is a natural English way of marking that main break.



Note that the following two sentences are word-for-word identical, differing only in where the comma falls.

(8) Either we'll have ice cream, or we'll have cake and we'll have champagne

(9) Either we'll have ice cream or we'll have cake, and we'll have champagne

Yet (8) and (9) make very different promises – for example, champagne is a sure thing with Sentence (9), but not so with (8). The placement of a single comma makes all the difference.

In (8) the comma falls right beside “or” – marking that as the main form phrase, and making (8) a *disjunction*. The left half of this disjunction is the subject matter sentence “We'll have ice cream,” while the right half is a conjunction: “We'll have cake and we'll have champagne”. Sentence (8) thus translates as formal sentence (8F).

**P:** We'll have ice cream

**Q:** We'll have cake

**R:** We'll have champagne

(8) Either we'll have ice cream, **or** we'll have cake and we'll have champagne

(8F)  $(P \underline{\vee} (Q \wedge R))$

In Sentence (9) the comma falls instead beside “and” – pegging it as the main form phrase, and so making (9) a *conjunction*. Its left part is the disjunction “Either we'll have ice cream or we'll have cake,” while the right is “We'll have champagne”. Using the same translation table, Sentence (9) translates as (9F).

(9) Either we'll have ice cream or we'll have cake, **and** we'll have champagne

(9F)  $((P \vee Q) \underline{\wedge} R)$

**Third**, a somewhat subtler clue comes from deleted repetition. For which repeated parts get deleted offers a clue as to which sentence is a part of which.<sup>2</sup> The following two sentences provide an example.

**P:** We're going to law school

**Q:** We're writing a novel

(10) We're not going to law school and writing a novel. (10F)  $\sim(P \wedge Q)$

(11) We're not going to law school and we're writing a novel. (11F)  $(\sim P \wedge Q)$

Think of (10) as the denial of the rumor that *we're going to law school and writing a novel*.

(10) We're not going to law school and writing a novel. (10F)  $\sim(P \wedge Q)$

Thanks to the deleted repetition in the sentence “[We’re] writing a novel,” (10) treats the sentence “We’re going to law school and writing a novel” as a unified ‘chunk,’ leaving the negation phrase outside that conjunction. That means: “not” beats out “and” in the competition to be main form phrase. If (10) is true, we may be going to law school or writing a novel, just not both.

By contrast, (11) can’t be read as the denial of a conjunction.

(11) We're not going to law school and we're writing a novel. (11F)  $(\sim P \wedge Q)$

With no deleted repetition in the right sentence “We’re writing a novel,” “not” attaches *only* to the left sentence “We’re going to law school”. Shunted off to the left part of the conjunction, “not” cannot act as the main form phrase of (11) – that role falling instead to “and”.<sup>3</sup>

Alas, the complexities of English stand in the way of full-proof techniques for English-to-Formalese translation. The blame for this falls once again on English; for Formalese is, by contrast, a remarkably orderly and well-behaved little language. But the small toolbox of clues we’ve assembled here will prove adequate for a wide variety of cases.

<sup>2</sup> Following an observation in (Quine 1982: 27-28).

<sup>3</sup> Other constructions that create such a sealed ‘chunk,’ locking the negation outside, are “without” sentences and sentences with relative clauses – both discussed in Section 3 of “3.10. Scope”.