

# reason and argument

John Kulvicki



## Schematization Strategies (and ligature madness)

There are many schematization strategies, and which one works depends in large measure on you. I'll give you some advice here but, trust me, this stuff gets easier, and you will develop your own preferred strategies, if you keep at it.

### 1: Find the parts.

You want to find the parts of a complex statement that are themselves statements. That is, you want to find the parts of a complex statement that can, on their own, be true or false.

### 2: Give each distinct part a unique name and each name a unique part.

Each distinct part of your complex statement deserves its own sentence letter and each sentence letter deserves its own statement. If the same statement shows up twice, use the same letter for it each time. Confusion and general malaise result if you fail to follow these rules.

### 3: Watch the negatives!

It's easy to mess up a perfectly good schematization if you fail to negate something when you should or negate something when you shouldn't. Consider the statement "there are no better deals around". You can schematize this as '-s' if you think of the statement as "there are better deals around", or you can just schematize it as 's' if you take the statement to be "there are no better deals around". Both work fine, unless you forget which you did. I tend to export the negations—'-s'—rather than hide them—s—because I find that less confusing, but you might differ in this respect.

### 4: Look at the language that connects the parts.

Remember that you want your schematization to show how the parts of a complex statement relate to one another in order to make up a whole. Different relations mean different truth

conditions for the complex statement, so once you have your sentence letters chosen, and you've made your decisions about the negations, look for the language that connects the parts. In general, the following rules apply (not always!):

'and', 'but'	=	&
'or', 'unless'	=	v
'if...then', 'only if'	=	→

### 5. Top-Down strategy: Ask: What is the main connector?

What? Well, if a statement has no parts, then you have to schematize it with nothing but a letter. But anytime a statement is complex you will most likely use two or more letters in your schematization. How do they relate? As #4 suggests, it's important to have a sense of which connectors—&, v, →—are being used, but you also need to know: is this whole statement a conjunction, a disjunction, or a conditional? Complex statements will have one of the following three forms, even if they are very complex otherwise:

Statement1 & Statement2,    Statement1 v Statement2,  
Statement 1→Statement2

The main connector is the thing that breaks the complex statement in two. Each part—Statement1 and Statement2—might itself be very complex, but any schematization will have a main connector, and then the schematization of Statement1 itself will have a main connector, and so on down the line. E.g.:

I might win, or lose, but I will always play the game.  
                   w                   l                                   p

Is this a conjunction or a disjunction? To me, it sounds like a conjunction:

(I might win, or lose) and (I will always play the game)

It doesn't sound like a disjunction:

(I might win) or (I might lose but always play the game)

Once you have the main connector, in this case '&', you look at the parts connected in this way and ask whether they are

complex or simple. In this case one part is simple and one is complex, so:

$$(I \text{ might win or } I \text{ might lose}) \ \& \ p$$

The first part looks to me like a disjunction, so it would be schematized as  $(w \vee l)$  for a final result:

$$(w \vee l) \ \& \ p$$

How about: "He will pass only if he studies and avoids drugs."

$$p \qquad \qquad \qquad s \qquad \qquad \qquad d$$

To me, this sounds like a conditional, not like a conjunction. That is, it sounds like:

$$(He \text{ will pass}) \text{ only if } (he \text{ studies and avoids drugs}).$$

It does NOT sound like:

$$(He \text{ will pass only if he studies}) \text{ and } (he \text{ avoids drugs}).$$

So, we then look at the parts and decide which are simple and which are complex. The antecedent is simple here, while the consequent is complex:

$$p \rightarrow (he \text{ studies and avoids drugs})$$

The consequent looks like a conjunction to me, which results in:

$$p \rightarrow (s \ \& \ d) \qquad \qquad \qquad \text{Easy!}$$

## 6. Write out one or two possibilities.

Sometimes, things are a little more complicated than the previous examples, so you can feel unsure which way to proceed. In that case, write out a couple of plausible possibilities and then check them. For example:

Students successfully schematize if they study, unless they hit the drugs.

$$l \qquad \qquad \qquad s \qquad \qquad \qquad d$$

You can see the parts well enough, but how do they hold together? Is this statement a conditional or a disjunction? We see 'unless' here, but we also see 'if' (note: it is not 'only if', but 'if' that appears here). You might try two options as a start:

(Students successfully schematize if they study) unless  
(they hit the drugs).  
(Students successfully schematize) if  
(they study unless they hit the drugs).

Now try to listen to these sentences, so organized. Which sounds right? Sometimes, this will help a lot, and you can pick the right one at this stage, then proceed to schematize it. Sometimes, you are still unsure, so you should schematize both. One of these is a disjunction:

(Students successfully schematize if they study) v d

The other is a conditional, but which conditional is it?

$1 \rightarrow$  (they study unless they hit the drugs) or,  
(they study unless they hit the drugs)  $\rightarrow 1$

Think! This will be important at some point anyway, because even the first option has a conditional in it. The word 'if' typically comes before the *antecedent* of a conditional, not the consequent. The phrase 'only if' or the word 'then' typically precedes a conditional's consequent. So, in this case I would think the correct conditional is:

(they study unless they hit the drugs)  $\rightarrow 1$

Now we have two options:

(they study unless they hit the drugs)  $\rightarrow 1$   
(Students successfully schematize if they study) v d

Fully schematized, the antecedent of the first one is a disjunction, since 'unless' usually corresponds to 'v'.

$(s \vee d) \rightarrow 1$

The other one has a conditional on one side of the disjunction, which, if we get the order right, amounts to: if they study (s), then students successfully schematize (l):

$$(s \rightarrow l) \vee d$$

Which of these two options is the superior one? There are two ways to figure it out.

### **7a. Translate the schemata back into English.**

In this case, the first one seems to say something like this:

If students study or hit the drugs, then they successfully schematize.

(I do not recommend hitting drugs as a schematization aid.)

The second one translates as:

If they study, then students successfully schematize, unless they hit the drugs.

This sounds closer to the spirit of the original. Only wishful thinking, or drugs, would make the first option seem more plausible.

Since one of these two options comes out as a clear winner, you can be fairly confident your answer is correct. Unless you missed an obvious choice, all is good. If you are worried, you can:

### **7b. Make a truth table.**

This option hurts, but it can be very helpful. In this case the table needs columns for l, s, d, and each of the two candidates:

$(s \rightarrow l) \vee d$  and  $(s \vee d) \rightarrow l$ . Since there are three sentence letters, the table will have  $2^3=8$  rows. You write out the table and then look at the circumstances in which each schema comes out true.

See next page.

l	s	d	$(s \vee d) \rightarrow l$	$(s \rightarrow l) \vee d$
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
<b>F</b>	<b>T</b>	<b>T</b>	<b>F</b>	<b>T</b>
T	F	F	T	T
F	T	F	F	F
<b>F</b>	<b>F</b>	<b>T</b>	<b>F</b>	<b>T</b>
F	F	F	T	T

These schemata agree, except in two cases. The first is that in which students do not successfully schematize, they study, and they do drugs. The second is that in which students do not successfully schematize, they do *not* study, and they do drugs. One of the candidates comes out false in each of these cases while the other comes out true. Which should we choose? Imagine two conversations with your mother. She believes wholeheartedly that:

Students successfully schematize if they study, unless they hit the drugs.

You: Hey Mom, I failed the quiz.

Mom: Did you study?

You: Of course!

Mom: Were you hitting the drugs?

You: Yes.

Mom: Told you so: Students successfully schematize if they study, unless they hit the drugs. Lay off the drugs, kid. Studying might not help if you're high.

You: Hey Mom, I failed the quiz.

Mom: Did you study?

You: No, I got high.

Mom: Told you so: Students successfully schematize if they study, unless they hit the drugs. Lay off the drugs, kid. Then you might find time to study.

Mom's around the world agree. The statement "Students successfully schematize if they study, unless they hit the drugs" is true in such cases. Don't disagree with your mother. One of those schematizations comes out false in these cases, but the one that comes out true is the better one, or so Mom says. You should pick ' $(s \rightarrow l) \vee d$ '.

## **8. Repeat**

Maybe you missed something along the way. If you wind up with unsatisfactory results at the end of these efforts, just go back and see if you missed something.

\*

This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.