

# (M) Colorless Green Concepts Scripting Furiously (1/2)

M1:  $(E \vee (D \rightarrow ((C \rightarrow \text{not} B) \wedge \text{not} A)))$

M2: (note that iv and vi are interchangeable, but they shouldn't have the same answer. I.e., you should either have (iv = B and vi = C) or (iv = C and vi = B))

- i = A
- ii = F
- iii = D
- iv = B/C
- v = E
- vi = B/C

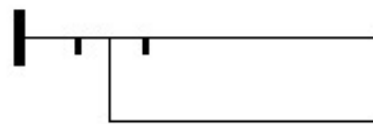
Solution path:

From page 1, we can figure out how the system works. I will do this by determining the representations for AND, OR, NOT, and IF/THEN; in reality, AND and OR can be further broken down, but I find it easier to treat them as atomic.

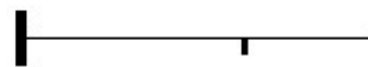
From the first one, we get OR:



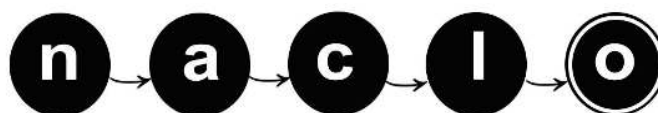
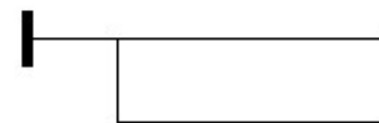
From the fifth one: Given the representation of OR above, we can factor out the  $(D \vee C)$  part to get that the part at the top is  $B \wedge A$ , to give us AND:



From the 2<sup>nd</sup> and the 4<sup>th</sup> ones: We can tell that the bottom part of the 2<sup>nd</sup> is  $C \rightarrow B$ , and the bottom part of the 4<sup>th</sup> is  $C \rightarrow \text{not} B$ . From that minimal pair, we get NOT:



We can finally get IF/THEN from, e.g., the 2<sup>nd</sup> one:



## (M) Colorless Green Concepts Scripting Furiously (2/2)

Now, to solve A: We first label the lines A through E.

Looking at the outermost layer gives us  $(E \vee \dots)$ , where we need to fill in the ...

The next layer expands it to  $(E \vee (D \rightarrow \dots))$

The next layer gives us an AND:  $(E \vee (D \rightarrow (\dots \wedge \dots)))$

The bottom part of the AND is  $C \rightarrow \text{not}B$ . The top part is  $\text{not}A$  (one of the two bars next to each other was part of the AND). So our final answer is:  $(E \vee (D \rightarrow ((C \rightarrow \text{not}B) \wedge \text{not}A)))$

And to solve B:

They give us this story, so we should first construct a logical statement to represent it.

First, it says "all this only holds true if the polyverse is Groop-normal." So our formula will be "the universe is Groop-normal"  $\rightarrow$  (everything else)

All the other ones seem to be about what things are guaranteed to be galactions. So it seems like it should become: "the universe is Groop-normal"  $\rightarrow$  ( $\dots \rightarrow$  "x is a galaction")

Now, under what conditions is x a galaction? First, all quaxors are galactions: "the universe is Groop-normal"  $\rightarrow$  ("x is a quaxor"  $\rightarrow$  "x is a galaction")

Also, if x is a pulsoid with a sateotrope that is not dingly: "the universe is Groop-normal"  $\rightarrow$   $((\text{"x is a quaxor"} \vee (\text{"x is a pulsoid"} \wedge \text{"x has a sateotrope"} \wedge \text{not "x is dingly"})) \rightarrow \text{"x is a galaction"})$

Now let's look at the diagram we are given. To turn it into a logical statement:

Label the lines A through F, from top to bottom

The outmost layer gives an IF/THEN:  $F \rightarrow \dots$

The next layer is also an IF/THEN, where the IF part is a bunch of stuff and the THEN is A:  $F \rightarrow (\dots \rightarrow A)$

The stuff in the dots gives us an OR:  $F \rightarrow ((E \vee \dots) \rightarrow A)$

The remaining dots give us an AND:  $F \rightarrow ((E \vee (\dots \wedge B)) \rightarrow A)$

The final part is  $\text{not}D$  and C:  $F \rightarrow ((E \vee (\text{not}D \wedge C \wedge B)) \rightarrow A)$

So this logical statement from the diagram almost maps nicely to the logical form we generated from the story. We have:

F = "the universe is Groop-normal"

E = "x is a quaxor"

D = "x is dingly")

C/B = "x has a sateotrope"/ "x is a pulsoid"

A = "x is a galaction"

5.  $\sim E \wedge D$

4.  $(\sim E \wedge D) \wedge C$

3.  $F \vee [(\sim E \wedge D) \wedge C]$

2.  $B \wedge \sim A$

1.  $F \vee [(\sim E \wedge D) \wedge C] \rightarrow B \wedge \sim A$

Final:  $G \rightarrow (F \vee [(\sim E \wedge D) \wedge C]) \rightarrow (B \wedge \sim A)$

