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

M1: \((E \lor (D \rightarrow ((C \rightarrow \text{not}B) \land \text{not}A)))\)

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

- 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:

```
  E
 /\  \
  D
   \ 
    B
  /
  C
```

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

```
  B
 /\  \
  A
   \ 
    C
  /
  D
```

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

```
  C
 /\  \
  B
   \ 
    C
  /
  D
```

We can finally get IF/THEN from, e.g., the 2\text{nd} one:

```
  E
 /\  \
  D
   \ 
    B
  /
  C
```

\[\text{n \ a \ c \ i \ l \ o}\]
Now, to solve A: We first label the lines A through E.

Looking at the outermost layer gives us (E v ...), where we need to fill in the ...
The next layer expands it to (E v (D -> ...))
The next layer gives us an AND: (E v (D -> (...^...)))
The bottom part of the AND is C -> notB. The top part is notA (one of the two bars next to each other was part of the AND). So our final answer is: (E v (D -> ((C -> notB) ^ notA)))

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” -> (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” -> (... "x is a galaction")
Now, under what conditions is x a galaction? First, all quaxors are galactions: “the universe is Groop-normal” -> ("x is a quaxor" -> "x is a galaction")
Also, if x is a pulsooid with a sateotrope that is not dingly: “the universe is Groop-normal“ -> (("x is a quaxor” v ("x is a pulsooid^ "x has a sateotrope^ not"x is dingly") -> "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 -> ...
The next layer is also an IF/THEN, where the IF part is a bunch of stuff and the THEN is A: F -> (... -> A)
The stuff in the dots gives us an OR: F -> ((E v ...) -> A)
The remaining dots give us an AND: F -> ((E v (... ^ B)) -> A)
The final part is notD and C: F -> ((E v (notD ^ C ^ B)) -> 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 pulsooid”
A = “x is a galaction”

5. ~E v D
4. (~E ^ D) v C
3. F v [(~E ^ D) v C]
2. B ^ ~A
1. F v [(~E ^ D) v C] -> B ^ ~A

Final: G -> (F v [(~E ^ D) v C]) -> (B ^ ~A)