Chapter 9, Step 2 Supplement

If you want to make life easy for yourself in the step 2 exercises, be sure to read and study carefully the section on Strategies for Pattern Recognition starting on page 402. If you put the necessary time in on learning each rule/pattern by studying the boxes in the previous section, then using the strategies on page 402 should make the step 2 exercises fairly easy.

Often, however, when I tutor students on campus who are having massive problems at this stage, I find that they are looking for some sort of shortcut. They have not put the time in on step 1. You cannot learn mathematical and logical procedures without drilling at a certain stage on foundations. When I was in the 3rd grade, every student had to stand up in front of the class and recite the entire basic multiplication table, from 1 x 1 to 10 x 10. I can still remember learning useful memorization devices such as, "Eight times eight fell on the floor, I picked it up and it was 64." As I recall, no third grader enjoyed having to stand up in front of the whole class and recite the tables. It was very intimidating, a threatening right of passage. Several years later, probably due to complaints from parents and a new education philosophy focusing on "self-esteem," my school dropped the requirement. In my opinion this was a big mistake. Students after my generation were not forced to master a foundational activity of mathematics.

Note that the suggested time for the practice quiz for step 1 is only five minutes. In fact, you should be able to redo all the exercises in step 1 in appreciably less time than 30 minutes. If you feel a little shaky on step 1, try each exercise again using the strategies on page 402. This section talks you through one of the hardest exercises in step 1 (# 14) using the strategies. Before we move on, let's use the strategies to do # 29, also a relatively hard exercise at first.

Starting with strategy 1 we look at the conclusion and ask the question, "Is the conclusion (~Z) part of a premise?" Because the answer is "yes," strategy 1 may work and we will now momentarily only consider modus ponens, disjunctive syllogism, and simplification. As the textbook explains, this is because these three rules have one thing in common -- they conclude a part of a premise. Next, we focus on how the ~Z is connected in the premise. We see that it is connected by a conditional (→), so of the three rules only modus ponens is left as a possibility.

So, the trick now is to compare only modus ponens and #29. If you try to do #29 by randomly looking at all the other rules and comparing each with #29, this is very time consuming and usually only makes you very nervous. I call this strategy the stare-and-hope method. It seldom works for most students. Instead, using strategy 1 we have narrowed our focus to one rule. Checking modus ponens carefully with #29 should show you that it works. The ~Z is in the consequent position -- the right place for a modus ponens -- and all that matters now is that the antecedent, A v ~(C ≡ D), is matched in the first premise.
This section of C9 talks you through how to use these same strategies for doing step 2 problems. Read these pages carefully.

Here is a summary of the thinking in this section courtesy of the logic teacher Ed George who also uses the textbook *Essential Logic*. Notice that because Ed had to use a graphics program and this is a gif-file, > replaces $\supset$ and & replaces •. Notice how Ed has shown us how each step in a step 2 problem can be seen via a step 1 perspective.

At this stage it is also a good idea to see the tutorials linked on the Main Page. The one for step 2 provides a similar tutorial via pop-ups.

Please note that sometimes strategy 1 will not only fail, but also even when the conclusion is part of a premise. Consider this proof:

1. $(A \lor B) \supset \neg C$
2. $A \land B \therefore \neg C$
3. $A$ (2) Simp.
4. $A \lor B$ ??
Many students will initially have trouble with line 4. Typically here is what a student will do. He or she will think, "Ok, 'A v B' is part of line 1, so I will try strategy 1 as the book says." But a close examination of strategy 1 rules and line 1 shows failure for a strategy 1 approach. Because the 'A v B' is connected by \( \rightarrow \), the only rule that can apply using strategy 1 is MP. But the 'A v B' is in the wrong position for MP.

\[
(A \lor B) \rightarrow \neg C \\
p \rightarrow q
\]

\[
?? / \therefore A \lor B \\
p / \therefore q
\]

It is not possible to find any premise (??) to make the pattern work for MP. After some staring most students will see that strategy 1 fails. They know that they must change the focus to strategy 2. However, many students will continue to look at line 1 and try to get it to work with strategy 2! This is a mixing of strategies that is guaranteed to produce failure of finding the correct pattern. If strategy 1 failed, then line 1 fails as well and we should not be looking at it all. Instead you need to completely change your perspective to strategy 2. This means looking at the connective in line 4 and considering only the Addition (ADD) and Constructive Dilemma (CD) rules. In trying ADD, we see the answer is right in front of us.

\[
A \\
p
\]/ \therefore A \lor B \\
p \lor \therefore q
\]

And the premise we need is line 3.

1. \((A \lor B) \rightarrow \neg C\)
2. \(A \bullet B / \therefore \neg C\)
3. \(A / (2) \text{ Simp.}\)
4. \(A \lor B / (3) \text{ ADD}\)
5. \(\neg C / (1)\)(4) \text{ MP}\)

Many students struggle with this line, and don’t see the easy answer in line 3, because they are locked into making line 1 work. As in critical thinking in general, in using the strategies you not only need to stay focused but also must be flexible enough to give up a perspective when it is not working.

Do the step 2 exercises now and then try the practice quiz. Notice the recommended time for the practice quiz.