

V. The exercises in this set represent frequently recurring patterns of inference found in longer formal proofs of validity. Familiarity with them will be useful in subsequent work. Construct a formal proof of validity for each of the following arguments.

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| ★ 1. $\sim A$
$\therefore A \supset B$ | 2. C
$\therefore D \supset C$ |
| 3. $E \supset (F \supset G)$
$\therefore F \supset (E \supset G)$ | 4. $H \supset (I \cdot J)$
$\therefore H \supset I$ |
| ★ 5. $K \supset L$
$\therefore K \supset (L \vee M)$ | 6. $N \supset O$
$\therefore (N \cdot P) \supset O$ |
| 7. $(Q \vee R) \supset S$
$\therefore Q \supset S$ | 8. $T \supset U$
$T \supset V / \therefore T \supset (U \cdot V)$ |
| 9. $W \supset X$
$Y \supset X$
$\therefore (W \vee Y) \supset X$ | 10. $Z \supset A$
$Z \vee A$
$\therefore A$ |

VI. Construct a formal proof of validity for each of the following arguments.

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| ★ 1. $A \supset \sim B$
$\sim(C \cdot \sim A)$
$\therefore C \supset \sim B$ | 2. $(D \cdot \sim E) \supset F$
$\sim(E \vee F)$
$\therefore \sim D$ |
| 3. $(G \supset \sim H) \supset I$
$\sim(G \cdot H)$
$\therefore I \vee \sim H$ | 4. $(J \vee K) \supset \sim L$
L
$\therefore \sim J$ |
| ★ 5. $[(M \cdot N) \cdot O] \supset P$
$Q \supset [(O \cdot M) \cdot N]$
$\therefore \sim Q \vee P$ | 6. $R \vee (S \cdot \sim T)$
$(R \vee S) \supset (U \vee \sim T)$
$\therefore T \supset U$ |
| 7. $(\sim V \supset W) \cdot (X \supset W)$
$\sim(\sim X \cdot V)$
$\therefore W$ | 8. $[(Y \cdot Z) \supset A] \cdot [(Y \cdot B) \supset C]$
$(B \vee Z) \cdot Y$
$\therefore A \vee C$ |
| 9. $\sim D \supset (\sim E \supset \sim F)$
$\sim(F \cdot \sim D) \supset \sim G$
$\therefore G \supset E$ | ★ 10. $[H \vee (I \vee J)] \supset (K \supset J)$
$L \supset [I \vee (J \vee H)]$
$\therefore (L \cdot K) \supset J$ |
| 11. $M \supset N$
$M \supset (N \supset O)$
$\therefore M \supset O$ | 12. $(P \supset Q) \cdot (P \vee R)$
$(R \supset S) \cdot (R \vee P)$
$\therefore Q \vee S$ |
| 13. $T \supset (U \cdot V)$
$(U \vee V) \supset W$
$\therefore T \supset W$ | 14. $(X \vee Y) \supset (X \cdot Y)$
$\sim(X \vee Y)$
$\therefore \sim(X \cdot Y)$ |
| ★ 15. $(Z \supset Z) \supset (A \supset A)$
$(A \supset A) \supset (Z \supset Z)$
$\therefore A \supset A$ | 16. $\sim B \vee [(C \supset D) \cdot (E \supset D)]$
$B \cdot (C \vee E)$
$\therefore D$ |
| 17. $\sim F \vee \sim[\sim(G \cdot H) \cdot (G \vee H)]$
$(G \supset H) \supset [(H \supset G) \supset I]$
$\therefore F \supset (F \cdot I)$ | 18. $J \vee (\sim J) \cdot K$
$J \supset L$
$\therefore (L \cdot J) \equiv J$ |

$$\begin{aligned}
 19. & (M \supset N) \cdot (O \supset P) \\
 & \sim N \vee \sim P \\
 & \sim (M \cdot O) \supset Q \\
 & \therefore Q
 \end{aligned}$$

$$\begin{aligned}
 20. & (R \vee S) \supset (T \cdot U) \\
 & \sim R \supset (V \supset \sim V) \\
 & \sim T \\
 & \therefore \sim V
 \end{aligned}$$

VII. Construct a formal proof of validity for each of the following arguments, in each case using the suggested notation.

★ 1. Either the manager didn't notice the change or else he approves of it. He noticed it all right. So he must approve of it. (N, A)

2. The oxygen in the tube either combined with the filament to form an oxide or else it vanished completely. The oxygen in the tube could not have vanished completely. Therefore the oxygen in the tube combined with the filament to form an oxide. (C, V)

3. If a political leader who sees her former opinions to be wrong does not alter her course, she is guilty of deceit; and if she does alter her course, she is open to a change of inconsistency. She either alters her course or she doesn't. Therefore either she is guilty of deceit or else she is open to a charge of inconsistency. (A, D, I)

4. It is not the case that she either forgot or wasn't able to finish. Therefore she was able to finish. (F, A)

★ 5. If the litmus paper turns red, then the solution is acid. Hence if the litmus paper turns red, then either the solution is acid or something is wrong somewhere. (R, A, W)

6. She can have many friends only if she respects them as individuals. If she respects them as individuals, then she cannot expect them all to behave alike. She does have many friends. Therefore she does not expect them all to behave alike. (F, R, E)

7. If the victim had money in his pockets, then robbery wasn't the motive for the crime. But robbery or vengeance was the motive for the crime. The victim had money in his pockets. Therefore vengeance must have been the motive for the crime. (M, R, V)

8. Napoleon is to be condemned if he usurped power that was not rightfully his own. Either Napoleon was a legitimate monarch or else he usurped power that was not rightfully his own. Napoleon was not a legitimate monarch. So Napoleon is to be condemned. (C, U, L)

9. If we extend further credit on the Wilkins account, they will have a moral obligation to accept our bid on their next project. We can figure a more generous margin of profit in preparing our estimates if they have a moral obligation to accept our bid on their next project. Figuring a more generous margin of profit in preparing our estimates will cause our general financial condition to improve considerably. Hence a considerable improvement in our general financial condition will follow from our extension of further credit on the Wilkins account. (C, M, P, I)

★ 10. If the laws are good and their enforcement is strict, then crime will diminish. If strict enforcement of laws will make crime diminish, then our problem is a practical one. The laws are good. Therefore our problem is a practical one. (G, S, D, P)