

2.42.1. The Deductive Challenge: Proof and Deduction Problems

A. **Translate** each of the following arguments into the formal language, and construct a **deduction** for each of the following sentences (without using any derived rules).

1. If Trixie's drinking champagne then she won the poker tournament. \therefore Trixie's not drinking champagne unless she won the poker tournament.
2. Either Dick had rum punch or Dora did. Either Dick didn't have rum punch or Dora did. Either Dick had rum punch or Dora didn't. \therefore Both Dick and Dora had rum punch. (*Note: showing the conclusion through ID and then DM wouldn't be any easier.*)
3. We're not having both truffles and grog. It's not the case that: we're having truffles without having grog. It's not the case that: we're having grog without having truffles. \therefore We're having neither truffles nor grog.
4. Suki's either hungry or hungry, and Neko's hungry too. \therefore Either Suki's hungry, or both she and Neko are hungry.

B. Do a proof of each of the following sentences (without using any derived rules).

T 2.1. $\sim(P \wedge \sim P)$

T 2.2. $(P \vee \sim P)$

T 2.3. $\sim(P \wedge \sim(P \vee P))$

T 2.4. $(P \vee \sim(P \vee P))$

T 2.5. $(P \vee (\sim P \vee \sim P))$

T 2.6. $(P \vee (\sim P \vee Q))$

$$T\ 2.7. (\sim Q \vee (\sim P \vee Q))$$

$$T\ 2.8. ((P \vee Q) \vee \sim(P \wedge Q))$$

$$T\ 2.9. ((P \vee Q) \vee (\sim P \wedge \sim Q))$$

$$T\ 2.10. ((\sim(P \vee Q) \vee \sim(\sim P \vee Q)) \vee Q)$$

$$T\ 2.11. (((P \wedge Q) \vee (\sim P \wedge Q)) \vee \sim Q)$$

$$T\ 2.12. (((P \vee Q) \wedge (\sim P \vee Q)) \vee \sim Q)$$

$$T\ 2.13. \sim(((P \wedge Q) \vee (\sim P \wedge Q)) \wedge \sim Q)$$

$$T\ 2.14. \sim(((P \vee Q) \wedge (\sim P \vee Q)) \wedge \sim Q)$$

$$T\ 2.15. \sim((\sim P \vee \sim P) \wedge (P \vee (P \wedge Q)))$$

$$T\ 2.16. (((P \wedge Q) \vee (\sim P \wedge Q)) \vee ((P \wedge \sim Q) \vee (\sim P \wedge \sim Q)))$$