

### 2.39.1. Indirect Deduction Problems

A. Show that each of the following formal arguments is valid by constructing an **indirect deduction** for it.

1.  $\sim P \therefore \sim(P \wedge Q)$

2.  $(P \vee R) \cdot (Q \vee R) \cdot (\sim P \vee \sim Q) \therefore R$

3.  $\sim(P \wedge \sim Q) \cdot \sim Q \therefore \sim(P \vee Q)$

4.  $\sim(P \wedge Q) \cdot (R \vee Q) \cdot \sim R \therefore \sim P$

5.  $(P \vee Q) \cdot (R \vee Q) \cdot \sim(P \wedge R) \therefore Q$

6.  $\sim(P \vee Q) \cdot (P \vee R) \therefore R$

7.  $(T \vee \sim(P \wedge Q)) \cdot (Q \vee \sim(R \wedge S)) \cdot (R \vee \sim S) \cdot (\sim T \wedge S) \therefore \sim P$

B. **Translate** each of the following arguments into the formal language; then show that the argument is valid by constructing a **deduction** for it.

1. Either Jimmy cracked corn and someone's in the kitchen with Dinah, or she'll be coming 'round the mountain. Unless she'll be coming 'round the mountain, I don't care. She won't be coming 'round the mountain.  
 $\therefore$  Jimmy cracked corn and I don't care.

2. Alfred is receiving good grades unless he's not studying. Unless he's receiving good grades, Alfred is not enjoying college. Alfred is either studying or enjoying college.  $\therefore$  Alfred is receiving good grades.

Adapted from Kalish and Montague 1964: 30 #20

3. Unless Trixie won the poker championship, we’re not having both ice cream and cake. Either we’re not having cake, or we’re going to have champagne. We’re having ice cream unless we’re not going to have champagne. We are having cake.  $\therefore$  Trixie won the poker championship.

4. Either both Neko and Jack are going to Logicpalooza, or Suki isn’t. Neko isn’t going to Logicpalooza, but either Jack or Suki is.  $\therefore$  Jack is going to Logicpalooza.

5. Both Suki and Neko ate dinner.  $\therefore$  Either Suki ate dinner and Jack did too, or Neko ate dinner but Jack didn’t.

6. Either I’m crazy, or Rex has lost weight. Rex hasn’t both lost weight and practiced for the pie-eating contest. Unless Rex has practiced for the pie-eating contest, Jake will win the prize this year and Rex will be depressed for a month. Although I’m not normal, I’m not crazy.  $\therefore$  Rex will be depressed for a month.

7. Letitia won’t be happy unless she beats Dr. Slim at checkers. Letitia and Lucretia won’t both beat Dr. Slim at checkers. Either Lucretia will beat Dr. Slim at checkers and Dr. Slim will beat Letitia at gin rummy, or Lucretia and Letitia will both beat Dr. Slim at checkers and Dr. Slim will beat Lucretia at gin rummy.  $\therefore$  Dr. Slim will beat Letitia at gin rummy, and she won’t be happy. (*Hint: deduce each half of the conjunction separately.*)