

### 3.39.1. 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 Rex has won the prize, we won't have both ice cream and cake. Either we won't have cake, or we're going to have champagne. We'll have ice cream unless we're not going to have champagne. We will have cake.  $\therefore$  Rex has won the prize.

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, Ace 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. Ace won't be happy unless he beats Dr. Slim at checkers. Ace and Rex won't both beat Dr. Slim at checkers. Either Rex will beat Dr. Slim at checkers and Dr. Slim will beat Ace at gin rummy, or Ace and Rex will both beat Dr. Slim at checkers and Dr. Slim will beat Rex at gin rummy.  $\therefore$  Dr. Slim will beat Ace at gin rummy, and Ace won't be happy.