

## Section 2.3, Number 39

Statements:

P: Lord Hazelton was killed by a blow on the head with a brass candlestick.

Q: Lady Hazelton was in the dining room at the time of the murder.

R: Sara, the maid, was in the dining room at the time of the murder.

S: The cook was in the kitchen at the time of the murder.

T: The butler killed Lord Hazelton with a fatal dose of strychnine.

U: The chauffeur killed Lord Hazelton.

V: The wine steward killed Lord Hazelton.

Statement Forms:

- (a)  $P$
- (b)  $Q \vee R$
- (c)  $S \rightarrow T$
- (d)  $Q \rightarrow U$
- (e)  $\sim S \rightarrow \sim R$
- (f)  $R \rightarrow V$
- (g) Assume there was only one cause of death:  $\sim (P \wedge T)$

Equivalences:

(h)  $\sim (P \wedge T) \equiv \sim P \vee \sim T$  by De Morgan's Laws

(i)  $\sim (\sim P) \equiv P$  by negation

Arguments:

1.  $\sim P \vee \sim T$  by (h)  
 $\sim (\sim P)$  by (i)  
 $\therefore \sim T$  by elimination
2.  $S \rightarrow T$  by (c)  
 $\sim T$  by the conclusion of (1)  
 $\therefore \sim S$  by modus tollens
3.  $\sim S \rightarrow \sim R$  by (e)  
 $\sim S$  by the conclusion of (2)  
 $\therefore \sim R$  by modus ponens
4.  $Q \vee R$  by (b)  
 $\sim R$  by the conclusion of (3)  
 $\therefore Q$  by elimination
5.  $Q \rightarrow U$  by (d)  
 $Q$  by the conclusion of (4)  
 $\therefore U$  by modus ponens

U: The chauffeur killed Lord Hazelton.