

- 11) 1. $(H \supset I) \cdot (J \supset K)$
 2. $K \vee H$
 3. $\sim K \quad \therefore I$
 4. H — 2, 3, D.S
 5. $\# \supset I$ — 1, Simp
 6. I — 5, 4, M.P

- 12) 1. $L \vee (M \supset N)$
 2. $\sim L \supset (N \supset O)$
 3. $\sim L \quad \therefore M \supset O$
 4. $M \supset N$ — 1, 3, D.S
 5. $N \supset O$ — 2, 3, M.P
 6. $M \supset O$ — 4, 5, H.S

- 13) 1. $(P \supset Q) \cdot (Q \supset P)$
 2. $R \supset S$
 3. $P \vee R \quad \therefore Q \vee S$
 4. $P \supset Q$ — 1, Simp
~~5. $R \supset (R \cdot S)$ — 2, Add.~~
 5. $(P \supset Q) \cdot (R \supset S)$ — 4, 2, Conj
 6. $Q \vee S$ — 5, 3, C.D

- 14) 1. $(T \supset U) \cdot (V \supset W)$
 2. $(U \supset X) \cdot (W \supset Y)$
 3. $T \quad \therefore X \vee Y$
 4. $T \vee V$ — 3, Add.
 5. $U \vee W$ — 1, 4, C.D
 6. $X \vee Y$ — 2, 5, C.D

- 15) 1. $(Z \cdot A) \supset B$
 2. $B \supset A$
 3. $(B \cdot A) \supset (A \cdot B) \quad \therefore (Z \cdot A) \supset (A \cdot B)$
 4. $B \supset (B \cdot A)$ — 2, Abs
 5. $(Z \cdot A) \supset (A \cdot B)$ — 1, 4, H.S