

Validity

(1)

(5) (a) বৈধতা বিচার ~~সত্যতা~~

(i) All scientist are respectable. All respectable scientist are scholars. Hence, all scientists are respectable scholars.

1. $(\forall x)(Sx \supset Rx)$
2. $(\forall x)[(Rx \cdot Sx) \supset Px] \therefore (M) [Sx \supset (Rx \cdot Px)]$
3. $Sa \supset Ra$ 1, U-I
4. $(Ra \cdot Sa) \supset Pa$ 2, U-I
5. $Ra \supset (Sa \supset Pa)$ 4, Exp
6. $Sa \supset (Sa \supset Pa)$ 3, S.I.H.S
7. $\sim Sa$

(ii) If either Socrates was happily married, or else he was not, then Socrates was great philosopher. Therefore, Socrates was a great philosopher.

1. $(H \vee \sim H) \supset G$ $\therefore G$
2. $[(H \vee \sim H) \supset G] \vee \sim H$ 1, Add
3. $\sim H \vee [(H \vee \sim H) \supset G]$ 2, Com
4. $H \supset [(H \vee \sim H) \supset G]$ 3, Impl
5. $H \supset \{H \cdot [(H \vee \sim H) \supset G]\}$ 4, Abs
6. $\sim H \vee \{H \cdot [(H \vee \sim H) \supset G]\}$ 5, Impl
7. $(\sim H \vee H) \cdot \{ \sim H \vee [(H \vee \sim H) \supset G] \}$ 6, Dist
8. $\sim H \vee H$ 7, Simp
9. $H \vee \sim H$ 8, Com
10. G 1, 9, M.P

Validity

②

- ① 1. $(M \supset N) \cdot (O \supset P)$
2. $(M \supset N) \supset (Q \supset R)$
3. $(S \supset R) \supset (O \cdot P) / \therefore O$
4. $M \supset N$ 1, simp
5. $S \supset R$ 2, 4, M.P
6. $O \cdot P$ 3, 5, M.P
7. O 6, simp

- ② 1. $A \vee D$
2. $E \cdot F$
3. $\sim A / \therefore D \cdot E$
4. D 1, 3, D.S
5. E 2, simp
6. $D \cdot E$ 4, 5, Conj

- ③ 1. $A \supset B$
2. $B \supset C$
3. $D \supset E$
4. $A \vee D / \therefore C \vee E$
5. $A \supset C$ 1, 2, H.S
6. $(A \supset C) \cdot (D \supset E)$ 5, 3, Conj
7. $C \vee E$ 6, 4, C.D

- ④ 1. $(A \supset \sim B) \cdot (\sim C \supset D)$
2. $(E \supset F) \cdot (\sim G \supset \sim H)$
3. $(\sim B \supset E) \cdot (D \supset \sim G)$
4. $(F \vee \sim H) \supset (R \cdot S)$
5. $A \vee \sim C / \therefore R \cdot S$
6. $\sim B \vee D$ 1, 5, E.D
7. $E \vee \sim G$ 3, 6, C.D
8. $F \vee \sim H$ 2, 7, C.D
9. $R \cdot S$ 4, 8, M.P

- ⑤ 1. $(A \vee G) \supset S$
2. $A \cdot T / \therefore S$
3. A 2, simp
4. $A \vee G$ 3, Add
5. S 1, 4, M.P

- ⑥ 1. $(\sim P \cdot Q) \supset (W \vee X)$
2. $\sim P \supset (W \supset Y)$
3. $P \vee (\sim X \supset \sim Z)$
4. $\sim P \cdot Q / \therefore Y \vee \sim Z$
5. $\sim P$ 4, simp
6. $W \supset Y$ 2, 5, M.P
7. $X \supset \sim Z$ 3, 5, D.S
8. $(W \supset Y) \cdot (X \supset \sim Z)$ 6, 7, Conj
9. $W \vee X$ 1, 4, M.P
10. $Y \vee \sim Z$ 8, 9, C.D

- ⑦ 1. $(A \supset B) \cdot (B \supset C)$
2. $C \supset \sim D$
3. $B \supset E$
4. $\sim D \supset F$
5. $\sim E \vee \sim F / \therefore \sim A \vee \sim C$
6. $A \supset B$ 1, simp
7. $A \supset E$ 6, 3, H.S
8. $C \supset F$ 2, 4, H.S
9. $(A \supset E) \cdot (C \supset F)$ 7, 8, Conj
10. $\sim A \vee \sim C$ 9, 5, D.D

- ⑧ 1. $A \vee \sim I$
2. $D \supset I$
3. $\sim A$
4. $(\sim D \cdot \sim I) \supset W / \therefore W$
5. $\sim I$ 1, 3, D.S
6. $\sim D$ 2, 5, M.T
7. $\sim D \cdot \sim I$ 6, 5, Conj
8. W 4, 7, M.P

- ⑨ 1. $O \vee (P \supset W)$
2. $O \supset X$
3. $(P \supset Y) \supset (W \supset Z)$
4. $(\sim O \cdot \sim X) \supset (W \supset Y)$
5. $\sim Y$
6. $\sim Z \vee \sim Y / \therefore \sim W \vee \sim P$
7. $\sim O$ 2, 5, M.T
8. $P \supset W$ 1, 7, D.S
9. $\sim O \cdot \sim Y$ 7, 5, Conj
10. $W \supset Y$ 4, 9, M.P
11. $P \supset Y$ 8, 10, H.S
12. $\sim W \supset Z$ 3, 11, M.P
13. $(W \supset Z) \cdot (P \supset Y)$ 12, 11, Conj
14. $\sim W \vee \sim P$ 13, 6, D.D

- ⑩ 1. $(\sim M \cdot N) \supset (O \vee P)$
2. $\sim M \supset (O \supset S)$
3. $M \vee (P \supset R)$
4. $\sim M \cdot N / \therefore S \vee R$
5. $\sim M$ 4, simp
6. $O \supset S$ 2, 5, M.P
7. $P \supset R$ 3, 5, D.S
8. $(O \supset S) \cdot (P \supset R)$ 6, 7, Conj
9. $O \vee P$ 1, 4, M.P
10. $S \vee R$ 8, 9, C.D

- ⑪ 1. $[(M \vee N) \vee O] \supset [P \supset (S \equiv R)]$
2. $(M \vee \sim N) \supset [(R \equiv S) \supset T]$
3. $M \supset [(S \equiv R) \supset (R \equiv S)]$
4. $M / \therefore P \supset T$
5. $M \vee \sim N$ 4, Add
- 6.

- ⑫ 1. $M \supset N$
2. $(M \cdot N) \supset O$
3. $\sim (M \cdot O) / \therefore \sim M$
4. $M \supset (M \cdot N)$ 1, Abs
5. $M \supset O$ 4, 2, H.S
6. $M \supset (M \cdot O)$ 5, Abs
7. $\sim M$ 6, 3, M.T

- 14) 1. $(X \vee Y) \supset (X \cdot Y)$
 2. $\sim (X \vee Y) / \therefore \sim (X \cdot Y)$
 3. $\sim X \cdot \sim Y$ 2, De.M
 4. $\sim X$ 3, Simp
 5. $\sim X \vee \sim Y$ 4, Add
 6. $\sim (X \cdot Y)$ 5, De.M

- 15) 1. $\sim B \vee [(C \supset D) \cdot (E \supset D)]$
 2. $B \cdot (C \vee E) / \therefore D$
 3. $(B \cdot C) \vee (B \cdot E)$ 2, Dist
 4. $[\sim B \vee (C \supset D)] \cdot [\sim B \vee (E \supset D)]$ 1, Dist
 5. $[B \supset (C \supset D)] \cdot [B \supset (E \supset D)]$ 4, Impl
 6. $[B \cdot C] \supset D$ 5, Exp
 7. D.V.D 6, 3, C.D
 8. D 7, Taut

- 16) 1. $\sim F \vee \sim [(G \cdot H) \cdot (G \vee H)]$
 2. $(G \supset H) \supset [(H \supset G) \supset I] / \therefore F \supset (F \cdot I)$
 3. $[(G \supset H) \cdot (H \supset G)] \supset I$ 2, Exp
 4. $(G \equiv H) \supset I$ 3, Equiv
 5. $F \supset \sim [\sim (G \cdot H) \cdot (G \vee H)]$ 1, Impl
 6. $F \supset [\sim \sim (G \cdot H) \vee \sim (G \vee H)]$ 5, De.M
 7. $F \supset [(G \cdot H) \vee \sim (G \vee H)]$ 6, D.N
 8. $F \supset [(G \cdot H) \vee (\sim G \cdot \sim H)]$ 7, De.M
 9. $F \supset (G \equiv H)$ 8, Equiv
 10. $F \supset I$ 9, 4, H.S
 11. $F \supset (F \cdot I)$ 10, Abs

- 17) 1. $(M \supset N) \cdot (O \supset P)$
 2. $\sim N \vee \sim P$
 3. $\sim (M \cdot O) \supset Q / \therefore Q$
 4. $(\sim N \supset \sim M) \cdot (\sim P \supset \sim O)$ 1, Trans
 5. $\sim M \vee \sim O$ 4, 2, C.D
 6. $\sim (M \cdot O)$ 5, De.M
 7. Q 3, 6, M.P

- 18) 1. $(Z \supset Z) \supset (A \supset A)$
 2. $(A \supset A) \supset (Z \supset Z) / \therefore (A \supset A)$
 3. $[(Z \supset Z) \supset (A \supset A)] \vee \sim A$ 1, Add
 4. $\sim A \vee [(Z \supset Z) \supset (A \supset A)]$ 3, Com
 5. $A \supset [(Z \supset Z) \supset (A \supset A)]$ 4, Impl
 6. $A \supset \{ A \cdot [(Z \supset Z) \supset (A \supset A)] \}$ 5, Abs
 7. $\sim A \vee \{ A \cdot [(Z \supset Z) \supset (A \supset A)] \}$ 6, Impl
 8. $(\sim A \vee A) \cdot \{ \sim A \vee [(Z \supset Z) \supset (A \supset A)] \}$ 7, Dist
 9. $\sim A \vee A$ 8, Simp
 10. $A \supset A$ 9, Impl

- 19) 1. $J \vee (\sim J \cdot K)$ — [B9]
 2. $J \supset L / \therefore (L \cdot J) \equiv J$
 3. $J \supset (J \cdot L)$ 2, Abs
 4. $(J \vee \sim J) \cdot (J \vee K)$ 1, Dist
 5. $J \vee \sim J$ 4, Simp
 6. $\sim J \vee J$ 5, Com
 7. $J \supset J$ 6, Impl
 8. $(J \supset J) \vee \sim L$ 7, Add
 9. $\sim L \vee (J \supset J)$ 8, Com
 10. $L \supset (J \supset J)$ 9, Impl
 11. $(L \cdot J) \supset J$ 10, Exp
 12. $J \cdot (L \cdot J)$ 3, Com
 13. $[(L \cdot J) \supset J] \cdot [J \cdot (L \cdot J)]$ 11, 12, Conj
 14. $(L \cdot J) \equiv J$ 13, Equiv

- 20) 1. $(R \vee S) \supset (T \cdot U)$
 2. $\sim R \supset (V \supset \sim Y)$
 3. $\sim T / \therefore \sim Y$
 4. $\sim T \vee \sim U$ 3, Add
 5. $\sim (T \cdot U)$ 4, De.M
 6. $\sim (R \vee S)$ 1, 5, M.T
 7. $\sim R \cdot \sim S$ 6, De.M
 8. $\sim R$ 7, Simp
 9. $V \supset \sim V$ 2, 8, M.P
 10. $\sim V \vee \sim V$ 9, Impl
 11. $\sim V$ 10, Taut

1) Either the manager did not notice the change or else he approves of it. He noticed it all right. So he must approve of it. (N,A)

1. $\sim N \vee A$
2. $N \therefore A$
3. $N \supset A$ 1, Impl
4. A 3, 2, M.P

2) The oxygen in the tube either combined with the filament to form an oxide or else it vanished completely. The oxygen in the tube could not have vanished completely. Therefore the oxygen in the tube combined with the filament to form an oxide. (C, V)

1. $C \vee V$
2. $\sim V \therefore C$
3. $V \vee C$ 1, Com
4. C 3, 2, D.S

3) If a Political leader who sees her former opinions to be wrong does not alter her course, she is guilty of deceit, and if she does alter her course, she is open to a charge of inconsistency. She either alters her course or she doesn't. Therefore either she is guilty of deceit or else she is open to a charge of inconsistency. (A, D, I)

1. $(\sim A \supset D) \cdot (A \supset I)$
2. $A \vee \sim A \therefore D \vee I$
3. $\sim A \vee A$ 2, Com
4. $D \vee I$ 1, 3, C.D

4) It is not the case that she either forgot or wasn't able to finish. Therefore she was able to finish. (F, A)

1. $\sim (F \vee \sim A) \therefore A$
2. $\sim F \cdot \sim \sim A$ 1, De.M
3. $\sim \sim A \cdot \sim F$ 2, Com
4. $\sim \sim A$ 3, Simp
5. A 4, D.N

5) If the litmus paper turns red, then the solution is acid. Hence if the litmus paper turns red, then either the solution is acid or something is wrong some where. (R, A, W)

1. $R \supset A \therefore R \supset (A \vee W)$
2. $\sim R \vee A$ 1, Impl
3. $(\sim R \vee A) \vee W$ 2, Add
4. $\sim R \vee (A \vee W)$ 3, Assoc
5. $R \supset (A \vee W)$ 4, Impl

6) She can have many friends only if she respects them as individuals. If she respects them as individuals, then she can not expect them all to be have alike. She does have many friends. Therefore she does not expect them all to be have alike. (F, R, E)

1. $F \supset R$
2. $R \supset \sim E$
3. $F \therefore \sim E$
4. R 1, 3, M.P
5. $\sim E$ 2, 4, M.P