

26. EXERCISES FOR CHAPTER 4

Directions: Translate each of the following statements into the language of sentential logic. Use the suggested abbreviations (capitalized words), if provided; otherwise, devise an abbreviation scheme of your own. In each case, write down what atomic statement each letter stands for, making sure it is a *complete sentence*. Letters should stand for positively stated sentences, not negatively stated ones; for example, the negative sentence 'I am not hungry' should be symbolized as ' $\sim H$ ' using 'H' to stand for 'I am hungry'.

EXERCISE SET A

1. Although it is RAINING, I plan to go JOGGING this afternoon.
2. It is not RAINING, but it is still too WET to play.
3. JAY and KAY are Sophomores.
4. It is DINNER time, but I am not HUNGRY.
5. Although I am TIRED, I am not QUITTING.
6. Jay and Kay are roommates, but they hate one another.
7. Jay and Kay are Republicans, but they both hate Nixon.
8. KEEP trying, and the answer will APPEAR.
9. GIVE him an inch, and he will TAKE a mile.
10. Either I am CRAZY or I just SAW a flying saucer.
11. Either Jones is a FOOL or he is DISHONEST.
12. JAY and KAY won't both be present at graduation.
13. JAY will win, or KAY will win, but not both.
14. Either it is RAINING, or it is SUNNY and COLD.
15. It is RAINING or OVERCAST, but in any case it is not SUNNY.
16. If JONES is honest, then so is SMITH.
17. If JONES isn't a crook, then neither is SMITH.
18. Provided that I CONCENTRATE, I will not FAIL.
19. I will GRADUATE, provided I pass both LOGIC and HISTORY.
20. I will not GRADUATE if I don't pass both LOGIC and HISTORY.

EXERCISE SET B

21. Neither JAY nor KAY is able to attend the meeting.
22. Although I have been here a LONG time, I am neither TIRED nor BORED.
23. I will GRADUATE this semester only if I PASS intro logic.
24. KAY will attend the party only if JAY does not.
25. I will SUCCEED only if I WORK hard and take RISKS.
26. I will go to the BEACH this weekend, unless I am SICK.
27. Unless I GOOF off, I will not FAIL intro logic.
28. I won't GRADUATE unless I pass LOGIC and HISTORY.
29. In order to ACE intro logic, it is sufficient to get a HUNDRED on every exam.
30. In order to PASS, it is necessary to average at least FIFTY.
31. In order to become a PHYSICIAN, it is necessary to RECEIVE an M.D. and do an INTERNSHIP.
32. In order to PASS, it is both necessary and sufficient to average at least FIFTY.
33. Getting a HUNDRED on every exam is sufficient, but not necessary, for ACING intro logic.
34. TAKING all the exams is necessary, but not sufficient, for ACING intro logic.
35. In order to get into MEDICAL school, it is necessary but not sufficient to have GOOD grades and take the ADMISSIONS exam.
36. In order to be a BACHELOR it is both necessary and sufficient to be ELIGIBLE but not MARRIED.
37. In order to be ARRESTED, it is sufficient but not necessary to COMMIT a crime and GET caught.
38. If it is RAINING, I will play BASKETBALL; otherwise, I will go JOGGING.
39. If both JAY and KAY are home this weekend, we will go to thereat; otherwise, we will STAY home.
40. JONES will win the championship unless he gets INJURED, in which case SMITH will win.

EXERCISE SET C

41. We will have DINNER and attend the CONCERT, provided that JAY and KAY are home this weekend.
42. If neither JAY nor KAY can make it, we should either POSTPONE or CANCEL the trip.
43. Both Jay and Kay will go to the beach this weekend, provided that neither of them is sick.
44. I'm damned if I do, and I'm damned if I don't.
45. If I STUDY too hard I will not ENJOY college, but at the same time I will not ENJOY college if I FLUNK out.
46. If you NEED a thing, you will have THROWN it away, and if you THROW a thing away, you will NEED it.
47. If you WORK hard only if you are THREATENED, then you will not SUCCEED.
48. If I do not STUDY, then I will not PASS unless the prof ACCEPTS bribes.
49. Provided that the prof doesn't HATE me, I will PASS if I STUDY.
50. Unless logic is very DIFFICULT, I will PASS provided I CONCENTRATE.
51. Unless logic is EASY, I will PASS only if I STUDY.
52. Provided that you are INTELLIGENT, you will FAIL only if you GOOF off.
53. If you do not PAY, Jones will KILL you unless you ESCAPE.
54. If he CATCHES you, Jones will KILL you unless you PAY.
55. Provided that he has made a BET, Jones is HAPPY if and only if his horse WINS.
56. If neither JAY nor KAY comes home this weekend, we shall not stay HOME unless we are SICK.
57. If you MAKE an appointment and do not KEEP it, then I shall be ANGRY unless you have a good EXCUSE.
58. If I am not FEELING well this weekend, I will not GO out unless it is WARM and SUNNY.
59. If JAY will go only if KAY goes, then we will CANCEL the trip unless KAY goes.

EXERCISE SET D

60. If KAY will come to the party only if JAY does not come, then provided we WANT Kay to come we should DISSUADE Jay from coming.
61. If KAY will go only if JAY does not go, then either we will CANCEL the trip or we will not INVITE Jay.
62. If JAY will go only if KAY goes, then we will CANCEL the trip unless KAY goes.
63. If you CONCENTRATE only if you are INSPIRED, then you will not SUCCEED unless you are INSPIRED.
64. If you are HAPPY only if you are DRUNK, then unless you are DRUNK you are not HAPPY.
65. In order to be ADMITTED to law school, it is necessary to have GOOD grades, unless your family makes a large CONTRIBUTION to the law school.
66. I am HAPPY only if my assistant is COMPETENT, but if my assistant is COMPETENT, then he/she is TRANSFERRED to a better job and I am not HAPPY.
67. If you do not CONCENTRATE well unless you are ALERT, then you will FLY an airplane only if you are SOBER; provided that you are not a MANIAC.
68. If you do not CONCENTRATE well unless you are ALERT, then provided that you are not a MANIAC you will FLY an airplane only if you are SOBER.
69. If you CONCENTRATE well only if you are ALERT, then provided that you are WISE you will not FLY an airplane unless you are SOBER.
70. If you CONCENTRATE only if you are THREATENED, then you will not PASS unless you are THREATENED – provided that CONCENTRATING is a necessary condition for PASSING.
71. If neither JAY nor KAY is home this weekend, we will go to the BEACH; otherwise, we will STAY home.

27. ANSWERS TO EXERCISES FOR CHAPTER 4

1. $R \ \& \ J$
2. $\sim R \ \& \ W$
3. $J \ \& \ K$
4. $D \ \& \ \sim H$
5. $T \ \& \ \sim Q$
6. $R \ \& \ (J \ \& \ K)$
 R: Jay and Kay are roommates
 J: Jay hates Kay
 K: Kay hates Jay
7. $(J \ \& \ K) \ \& \ (H \ \& \ N)$
 J: Jay is a Republican; K: Kay is a Republican
 H: Jay hates Nixon; N: Kay hates Nixon
8. $K \rightarrow A$
9. $G \rightarrow T$
10. $C \vee S$
11. $F \vee D$
12. $\sim(J \ \& \ K)$
13. $(J \vee K) \ \& \ \sim(J \ \& \ K)$
14. $R \vee (S \ \& \ C)$
15. $(R \vee O) \ \& \ \sim S$
16. $J \rightarrow S$
17. $\sim J \rightarrow \sim S$
18. $C \rightarrow \sim F$
19. $(L \ \& \ H) \rightarrow G$
20. $\sim(L \ \& \ H) \rightarrow \sim G$
21. $\sim J \ \& \ \sim K$ [or: $\sim(J \vee K)$]
22. $L \ \& \ (\sim T \ \& \ \sim B)$ [or: $L \ \& \ \sim(T \vee B)$]
23. $G \rightarrow P$
24. $J \rightarrow \sim K$
25. $S \rightarrow (W \ \& \ R)$
26. $\sim S \rightarrow B$
27. $\sim G \rightarrow \sim F$
28. $\sim(L \ \& \ H) \rightarrow \sim G$
29. $H \rightarrow A$
30. $P \rightarrow F$
31. $P \rightarrow (R \ \& \ I)$
32. $P \leftrightarrow F$
33. $(H \rightarrow A) \ \& \ \sim(A \rightarrow H)$
34. $(A \rightarrow T) \ \& \ \sim(T \rightarrow A)$
35. $(M \rightarrow (G \ \& \ A)) \ \& \ \sim((G \ \& \ A) \rightarrow M)$
36. $B \leftrightarrow (E \ \& \ \sim M)$
37. $((C \ \& \ G) \rightarrow A) \ \& \ \sim(A \rightarrow (C \ \& \ G))$
38. $(R \rightarrow B) \ \& \ (\sim R \rightarrow J)$
39. $[(J \ \& \ K) \rightarrow B] \ \& \ [\sim(J \ \& \ K) \rightarrow S]$
40. $(\sim I \rightarrow J) \ \& \ (I \rightarrow S)$

41. $(J \& K) \rightarrow (D \& C)$
 42. $(\sim J \& \sim K) \rightarrow (P \vee C)$
 43. $(\sim S \& \sim T) \rightarrow (J \& K)$
 S: Jay is sick; T: Kay is sick;
 J: Jay will go to the beach; K: Kay will go to the beach.
44. $(A \rightarrow D) \& (\sim A \rightarrow D)$
 A: I do (what ever action is being discussed);
 D: I am damned.
45. $(S \rightarrow \sim E) \& (F \rightarrow \sim E)$
 46. $(N \rightarrow T) \& (T \rightarrow N)$
 47. $(W \rightarrow T) \rightarrow \sim S$
 48. $\sim S \rightarrow (\sim A \rightarrow \sim P)$
 49. $\sim H \rightarrow (S \rightarrow P)$
 50. $\sim D \rightarrow (C \rightarrow P)$
 51. $\sim E \rightarrow (P \rightarrow S)$
 52. $I \rightarrow (F \rightarrow G)$
 53. $\sim P \rightarrow (\sim E \rightarrow K)$
 54. $C \rightarrow (\sim P \rightarrow K)$
 55. $B \rightarrow (H \leftrightarrow W)$
56. $(\sim J \& \sim K) \rightarrow (\sim S \rightarrow \sim H)$
 57. $(M \& \sim K) \rightarrow (\sim E \rightarrow A)$
 58. $\sim F \rightarrow [\sim(W \& S) \rightarrow \sim G]$
 59. $(J \rightarrow K) \rightarrow (\sim K \rightarrow C)$
 60. $(K \rightarrow \sim J) \rightarrow (W \rightarrow D)$
 61. $(K \rightarrow \sim J) \rightarrow (C \vee \sim I)$
 62. $(J \rightarrow K) \rightarrow (\sim K \rightarrow C)$
 63. $(C \rightarrow I) \rightarrow (\sim I \rightarrow \sim S)$
 64. $(H \rightarrow D) \rightarrow (\sim D \rightarrow \sim H)$
 65. $\sim C \rightarrow (A \rightarrow G)$
 66. $(H \rightarrow C) \& (C \rightarrow (T \& \sim H))$
67. $\sim M \rightarrow ((\sim A \rightarrow \sim C) \rightarrow (F \rightarrow S))$
 68. $(\sim A \rightarrow \sim C) \rightarrow (\sim M \rightarrow (F \rightarrow S))$
 69. $(\sim A \rightarrow \sim C) \rightarrow (W \rightarrow (\sim S \rightarrow \sim F))$
 70. $(P \rightarrow C) \rightarrow ((C \rightarrow T) \rightarrow (\sim T \rightarrow \sim P))$
 71. $[(\sim J \& \sim K) \rightarrow B] \& [\sim(\sim J \& \sim K) \rightarrow S]$