Logic—Sample Test B2

NAME _____

1. Define ‘counterexample’. (10 points)

2. Define ‘valid’. (20 points)

Translate the following sentences into the language of sentential logic using the abbreviations given to you. (These problems are worth 2 points each.)

D = “Morgan enjoys dancing.”
T = “Morgan will go out tonight.”
Y = “Morgan went out yesterday.”
C = “Christine will see Morgan at the club tonight.”
H = “Morgan has a hangover.”
J = “Jules has a good cure.”

3. “Morgan will go out tonight only if she enjoys dancing.”

4. “Morgan has a hangover if she went out yesterday.”

5. “Unless Morgan doesn’t enjoy dancing, she will go out tonight.”

6. “Morgan is going out if and only if she did not go out yesterday.”

7. “If Morgan went out yesterday and has a hangover, then Christine will not see Morgan at the club tonight.”

8. “If Morgan has a hangover, then if Jules has a good cure, Christine will see Morgan at the club tonight.”

9. “Morgan won’t go out tonight if Jules doesn’t have a good cure.”

10. “It’s untrue that Morgan either went out yesterday or is going out tonight.”

11. "Jules doesn't have a good cure; unless Morgan doesn't have a hangover, Christine is not going to see her at the club tonight."

12. "If Christine sees Morgan at the club tonight, then either Morgan didn't go out last night or she did go out but doesn't have a hangover."

Suppose we add the symbol '@' to our logic and we define its truth table as

| *p* | *q* | (*p* @ *q*) |
|---|---|---|
| T | T | F |
| F | T | T |
| T | F | T |
| F | F | F |

Construct truth tables to test whether these arguments are valid or invalid. *In the case of an invalid argument indicate the row or rows that show that the argument is invalid by circling at least one of them.* (3 points).

13. $\dfrac{E \mathbin{@} \sim F}{E \vee F}$

| | | | |
|---|---|---|---|
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| | | | |
| | | | |

Which is it: valid or invalid? _____
If it is invalid, circle a row that proves that it is invalid.

Test each of the following pairs of sentences for logical equivalence by constructing their truth tables. Label for each whether they are equivalent or inequivalent. (3 points)

14. $(G \mathbin{@} H)$ $((G \vee H) \mathbin{\&} \sim(H \mathbin{\&} G))$

| | | | |
|---|---|---|---|
| | | | |
| | | | |
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Which is it: equivalent or inequivalent? _____
If they are inequivalent, circle a row that proves that they are inequivalent.

# Logic—Sample Test B2

Use the truth tree method to determine whether the set of sentences is consistent. Number all lines. Label all derived lines with the rule and the line from which they were derived. Answers should look just as in the book (except that you should cross out each complex sentence after you use it). Complete the truth tree. (8 points each)

15. $\{ \sim(\sim G \vee \sim L), (\sim P \supset X) \,\&\, \sim L, \sim\sim\sim Y \vee \sim(R \,\&\, W) \}$

16. $\{ \sim(S \vee \sim Q), \sim R \supset S, T, R \vee Q \}$

# Logic—Sample Test B2

Use the truth tree method to determine whether the argument is valid.
Number all lines. Label all derived lines with the rule and the line from which they were derived. Complete the truth tree. Label the argument as valid or invalid.
Answers should look just as in the book (except that you should cross out each complex sentence after you use it). (8 points each)

17. $E \,\&\, \sim(I \vee D)$
$\sim E \vee (I \,\&\, D)$
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$E \,\&\, \sim D$

18. $\sim(U \,\&\, (O \,\&\, N))$
$(O \supset N) \,\&\, (N \supset O)$
$U \vee (\sim U \,\&\, (O \,\&\, N))$

19. Using the given atomic sentences, translate the argument below into the language of propositional logic. Use the truth tree method to determine whether the argument is valid. Number all lines. Label all derived lines with the rule and the line from which they were derived. Complete the truth tree. Label the argument as valid or invalid. Answers should look just as in the book (except that you should cross out each complex sentence after you use it). (5 points for the translation; 7 points for the truth tree)

H = “Damion went home.”
F = “Damion finished Damion’s assignment.”
C = “Damion copied his friend’s paper.”
K = “Damion knows the material.”

Damion either went home and finished his assignment, or he did neither.
If Damion went home, then he either copied his friend’s paper or didn’t finish his assignment.
It isn’t the case that if Damion copied his friend’s paper, the material is unknown to Damion.
Thus, Damion finished his assignment and knows the material.