

Logic—Sample Test B3

NAME _____

1. Define 'counterexample'. (10 points)

2. Define 'valid'. (20 points)

Identify the following arguments properly. If the argument is valid, mark it with a V. If it is invalid mark it with an I. (These problems are worth 2 points each)

3. There is a mountain taller than every mountain in existence.

There is snow on the peak of the tallest mountain.

4. Jamie likes to eat Eskimo pies.

Thus, if Jamie doesn't like to eat Eskimo pies, then she also dislikes pumpkin pies.

5. The light will come on only if you flip the switch.

Thus, if you flip the switch, the light will come on.

6. If lightning strikes, then we won't hear the thunder.

Thus, thunder is a kind of sound.

7. Humans have stood on the surface of the moon.

Thus, if humans have never been near the surface of the moon, then they have stood on the surface of the moon.

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Translate the following sentences into the language of sentential logic using the given abbreviations. Remember that you do not need to worry about tense. For example, “The food is good,” is equivalent to “The food will be good.” (These problems are worth 2 points each.)

F = “The food is good.”

G = “Guy makes potatoes.”

J = “Joe makes potatoes.”

H = “Henry cooks.”

P = “Paul cooks.”

8. “If Henry, but not Paul, cooks, then the food won’t be good.”
9. “Unless Guy makes potatoes, the food will be good.”
10. “Guy is making potatoes if and only if Joe does too.”
11. “If Joe doesn’t make potatoes then the food will only be good if Guy makes them instead.”
12. “Unless Paul is doing the cooking, if the food turns out to be good, then it is Henry who is cooking.”
13. “If neither Paul nor Henry cooks, the food won’t be any good.”
14. “In every case where the food is good, either Guy is making potatoes and Henry is cooking or Joe is making potatoes with Paul cooking.”
15. “The only way Henry ever cooks is if Joe and Guy are making potatoes.”
16. “Barring some circumstance where Guy is making potatoes, Paul will do the cooking.”
17. “It is neither the case that Paul does the cooking if Henry does, nor is it the case that Guy makes potatoes if Joe does.”

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Suppose we add the symbol ‘|’ to our logic and we define its truth table as

p	q	$(p q)$
T	T	F
T	F	F
F	T	F
F	F	T

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

$$\begin{array}{l}
 18. \quad A | (B | B) \\
 \quad \quad B \supset A \\
 \hline
 \quad \quad \sim B | A
 \end{array}$$

A	B	$A (B B)$	$B \supset A$	$\sim B A$

Which is it: valid or invalid?
 (If it is invalid, circle any row that proves that it is invalid.)

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

$$19. \quad C \vee D \qquad (C | D) | (D | C)$$

C	D	$C \vee D$	$(C D) (D C)$

Which is it: equivalent or inequivalent?
 If they are inequivalent, circle the row that proves that they are inequivalent.

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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. Label the tree as consistent or inconsistent. (6 points each)

20. $\{ \sim A \supset C, C \supset B, \sim(A \supset C) \}$

21. $\{ \sim(A \supset \sim\sim(C \& B)), \sim(B \vee D), (C \supset D) \}$

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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. Label the argument as valid or invalid. (6 points each)

$$\begin{array}{l} 22. \quad D \supset \sim((A \ \& \ B) \ \& \ (B \ \vee \ C)) \\ \quad \quad D \\ \hline \quad \quad \sim B \ \& \ A \end{array}$$

$$\begin{array}{l} 23. \quad \sim(P \ \vee \ T) \\ \quad \quad \sim P \ \supset \ (\sim R \ \vee \ T) \\ \hline \quad \quad \sim T \end{array}$$

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24. Translate the following argument using the symbolization provided, and evaluate whether the argument is valid using the truth tree method. (4 points for the translation, and 6 points for the truth tree.)

Yolanda will come if Elena does too.

Elena will avoid coming only if Rachel and Julie come.

Unless Yolanda fails to come, Rachel will come.

Either Julie or Elena will come.

Let Y = “Yolanda is coming.”

Let E = “Elena is coming.”

Let R = “Rachel is coming.”

Let J = “Julie is coming.”