Introduction to Logical Reasoning

Problem Set #7: Assessing Arguments with Truth Tables

Although I strongly suggest that you write out answers to all these problems, you do *not* have to turn in any written responses. You do, however, need to be prepared to do these types of problems, for questions on the weekly quizzes and exams will primarily be drawn from the problem sets. The solutions to these problems will be provided, so you can check your own work and seek help from me as necessary.

We will devote considerable time to these types of problems during the next in-class workshop. In order to make that workshop productive, please make a solid start on them. That way you can use the workshop to address the difficulties you are facing.

If you do the extra credit logic puzzle, you must email me your solution by Sunday, October 20ᵀᴴ at 12:00PM (noon). Late extra credit will not be considered, no exceptions.

Part A Instructions

Each of the following problems presents an argument. For each, use the truth table method from class (or the textbook) to determine whether it is a valid or invalid argument. Be sure to briefly explain how the truth table supports your answer concerning the validity of the argument.

Part A Problems

1. 1. $a \& b.$
    $\therefore a.$

2. 1. $p \rightarrow q.$
    2. $p.$
    $\therefore q.$

3. 1. $p \lor q.$
    2. $p.$
    $\therefore \sim q.$

4. 1. $p \rightarrow q.$
    2. $\sim p.$
    $\therefore q.$

5. 1. $a \& b.$
    2. $\sim a.$
    $\therefore b.$

6. 1. $p \rightarrow q.$
    2. $q \rightarrow r.$
    $\therefore q.$

7. 1. $p \rightarrow q.$
    2. $\sim q \& r.$
    $\therefore r.$

8. 1. $a \lor (b \& c).$
    2. $\sim (b \& c).$
    $\therefore a.$

9. 1. $x \rightarrow y.$
    2. $y \rightarrow z.$
    $\therefore x \rightarrow z.$

10. 1. $p \rightarrow q.$
    $\therefore p \rightarrow (p \& q).$

11. 1. $a \rightarrow b.$
    2. $b \rightarrow c.$
    $\therefore (b \& c) \lor (a \& b).$

12. 1. $a \lor (b \rightarrow c).$
    2. $b \& \sim c.$
    $\therefore \sim a.$

13. 1. $(p \lor q) \rightarrow (p \& q).$
    2. $p \& q.$
    $\therefore p \lor q.$

14. 1. $p \rightarrow q.$
    2. $\sim (q \lor r).$
    $\therefore \sim p.$

15. 1. $d \rightarrow e.$
    2. $e \lor f.$
    3. $e.$
    $\therefore d \& f.$

16. 1. $(p \rightarrow q) \rightarrow (p \rightarrow r).$
    2. $\sim (p \rightarrow q).$
    3. $\sim r.$
    $\therefore p.$

17. 1. $(d \lor e) \rightarrow f.$
    2. $f \rightarrow (d \& e).$
    $\therefore (d \& e) \rightarrow (d \lor e).$

18. 1. $\sim (d \& e).$
    2. $e \lor f.$
    $\therefore \sim d \& e.$

19. 1. $d \& (\sim e \rightarrow \sim d).$
    2. $f \rightarrow \sim e.$
    $\therefore f.$

20. 1. $d \lor \sim e.$
    2. $f \rightarrow e.$
    $\therefore d \rightarrow \sim f.$

Part B Instructions

Each of the following problems presents an argument in English. For each, (1) translate it into the language of symbolic logic, using the indicated capital letters to label each simple positive statement involved, (2) put it into argumentative form, and (3) use the truth table method from class (or the textbook) to determine whether the argument is valid or invalid. Be sure to briefly explain how the truth table supports your answer concerning the validity of the argument.

Part B Problems

1. If there is no rain soon, the crops will die. If the crops die, there will be no food for the coming winter. The crops will not die. Therefore, there will be rain soon. (R, D, F)

2. If we give kidnappers the money that they demand, then further kidnappings will be encouraged. If we do not give kidnappers the money that they demand, the kidnappers will kill the hostages. We will not give kidnappers the money that they demand. Therefore, the kidnappers will kill the hostages. (G, E, K)

3. Jake is the plumber or Jake is the carpenter. Jake is not the carpenter. Therefore, Jake is the plumber. (P, C)

4. "Men, it is assumed, act in economic matters only in response to pecuniary compensation or to force. Force in the modern society is largely, although by no means completely, obsolete. So only pecuniary compensation remains of importance." [John Kenneth Galbraith, *The New Industrial State*] (C, F)

5. If the lake freezes, then the lake-effect snow will stop. If the lake-effect snow stops, the streets will be easier to plow. Therefore, the streets will be easier to plow. (F, S, P)

Problem Set #7: Assessing Arguments with Truth Tables

6. Either Emilio walks or he takes the train. And either Joann takes the train or she does not take the train. If Emilio walks, then Joann takes the train. Emilio takes the train. So Joann will not take the train. (W, T, J)

7. UN peacekeepers will not attack the local militants, provided that the militants behave themselves. The militants will not make trouble if the UN peacekeepers don't attack. Therefore, UN peace-keepers will not attack the local militants, and the militants will not make trouble. (B, A, T)

8. "If then, it is agreed that things are either the result of coincidence or for an end, and these cannot be the result of coincidence or spontaneity, it follows that they must be for an end." [Aristotle, *Physics*] (C, E, S)

9. Either there is evidence that women of supernatural powers (i.e., witches) exist, or there is no such evidence. If there is no such evidence, then we have no reason to believe in witches. If there is evidence, we do have reason to believe in witches. There is no such evidence. Therefore, we have no reason to believe in witches. (E, R)

10. Either the herbal remedy alleviated the symptoms, or the placebo effect alleviated the symptoms. If the placebo effect is responsible for easing the symptoms, then the herbal remedy is worthless. The herbal remedy alleviated the symptoms. So the herbal remedy is not worthless. (H, P, W)

11. Unless both Mary goes and Henry goes, the party will be a disaster. The party will be a disaster. Therefore, both Mary and Henry will not go. (M, H, D)

Note: There may a lot of exercises here. Do not feel obligated to do all of them. I often assign many exercises so that you have plenty of opportunities to practice the skills these exercises are trying to impart. I suggest doing just enough of them so that you are confident that you could use these skills on a quiz or an exam.

Extra Credit Logic Puzzle

A wily young logician once met a famous movie actress, and he wished to kiss the young woman's hand. He said to her, "I would like to ask you a favor. I will make a statement. All I ask is that if the statement is true, then you give me your autograph. Will you do that for me?"

"I don't see why not," replied the young woman.

"But," continued the logician, "you must promise that if my statement is false, then you don't give me your autograph. Agreed?"

"All right," said the young woman, "this sounds easy."

The young man then made a statement such that, after a little thought, the actress, who was no slouch in logic either, realized (to her secret amuse-ment) that the only way she could keep her word was to *not* give the man her autograph, but to allow him to kiss her hand.

Question: What statement could the logician have said for this to happen?

To receive full credit you must justify your answer with a logical argument showing why you are 100% right. That is to say, this question has a definitive answer that can be justified without *any* guessing on your part.