Practice Problem Set

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Due Aug 30, 9:30am

For practice problems, see TLB p.14 #1 and #2.

1   True/False

Determine whether each of the following statements is true or false, and prove your answer with an example when possible.

1. All logically invalid arguments are not logically sound. (If you answer FALSE, provide an example of an argument that proves this.)

   True. One of the criteria to being logically sound is being logically valid.

2. All logically valid arguments have true conclusions. (If you answer FALSE, provide an example of an argument that proves this.)

   False, for example:

   > **P1. All cats are friendly.**
   > **P2. Titan is a cat.**
   > **C. Titan is friendly.**

   This argument is logically valid, but has a false conclusion. (Titan, my cat, isn't friendly.)

3. All logically sound arguments are logically valid. (If you answer FALSE, provide an example of an argument that proves this.)

   True, as per the definition of logical soundness.

4. All logically valid arguments are logically sound. (If you answer FALSE, provide an example of an argument that proves this.)

   False, see the example given for # 2 above. That argument is logically valid, but P1 is false. Since it has a false premise, that argument is not logically sound.

5. All logically unsound arguments are logically invalid. (If you answer FALSE, provide an example of an argument that proves this.)

   False, see the example given for #2 above. That argument is logically valid, but is logically unsound due to having a false premise.

6. Some arguments are both logically sound and logically invalid. (If you answer TRUE, provide an example of an argument that proves this.)

   False, due to the definition of logical soundness.

7. All arguments with true premises and a true conclusion are logically sound. (If you answer FALSE, provide an example of an argument that proves this.)

   False, for example:

   > **P1. Austin is located in Texas.**
   > **P2. Texas is located in the United States.**
   > **C. California is located in the United States.**

   This argument has true premises and a true conclusion, but it is not logically valid; therefore it is not logically sound.

8. Some logically sound arguments have false conclusions. (If you answer TRUE, provide an example of an argument that proves this.)

   False.

9. All arguments with a logically false premise are valid. (If you answer FALSE, provide an example of an argument that proves this.)

   True.

10. Some argument with a logically false conclusion is valid. (If you answer TRUE, provide an example of an argument that proves this.)

    True, for example:

    > **P1. It's raining.**
    > **P2. It's not raining.**
    > **C. It's raining and it's not raining.**

11. All arguments with two logically equivalent premises are logically valid. (If you answer FALSE, provide an example of an argument that proves this.)

    False, for example:

P1. Mary is shorter than Sue.
P2. Sue is taller than Mary.
C. Mary has smaller feet than Sue.

12. All arguments with a conclusion that's logically equivalent to one of its premises is logically valid. (If you answer FALSE, provide an example of an argument that proves this.)

    True.

13. No logically valid argument has a logically inconsistent set of premises. (If you answer FALSE, provide an example of an argument that proves this.)

    False, see the example for #10.

14. All sound arguments have a logically consistent set of premises. (If you answer FALSE, provide an example of an argument that proves this.)

    True.

15. All unsound arguments have a premise that is logically indeterminate. (If you answer FALSE, provide an example of an argument that proves this.)

    False, for example:

    P1. Either it's raining or it's not raining.
    C. It's raining.

    This argument is not valid, hence it is not sound. But its only premise is logically true, not logically determinate.

2 Proofs

Prove the following results.

1. Suppose that **P** is logically true and that {**P**, **Q**} is logically inconsistent. Prove that any argument with **Q** as a premise is logically valid.

    Proof: If {P,Q} is logically inconsistent, then it's impossible for P and Q to be true together. We know P must be true since it's logically true, so Q must be false. (If Q could be true, then {P,Q} would be logically consistent, contrary to the assumption!) So, Q is logically false. Any

argument with a logically false premise is logically valid (trivially), since it's not possible for the premises to be true while the conclusion is false. So, any argument with Q as a premise is logically valid.

2. Consider an argument with premises **P1**, **P2**, **P3** and conclusion **C**. Now suppose (i) that **C** and **D** necessarily have different truth values, and (ii) that {**P1, P2, P3, D**} is a logically inconsistent set. Prove that the argument (from **P1**, **P2**, and **P3** to **C**) is logically valid.

Proof. Since {P1, P2, P3, D} is logically inconsistent, it's impossible for P1, P2, P3, and D to all be true together. That means that if P1, P2 and P3 were true, D would be false. But since C always has the opposite truth-value than D, it also follows that if P1, P2 and P3 were true, then C would be true, too. It's therefore impossible for the premises (P1, P2, and P3) to be true while the conclusion (C) is false, so the argument is logically valid.