

<https://sharegpt.com/c/OWsCCDY>

Me:

Write a list of logic entailment practice problems.

GPT:

Here are some practice problems involving logic entailment:

1. If all dogs are mammals, and all mammals have four legs, then all dogs have four legs. (True or False?)
2. If it rains today, then the streets will be wet. If the streets are wet, then it must have rained. (True or False?)
3. If A is a subset of B, and B is a subset of C, then A is a subset of C. (True or False?)
4. If it is not raining, then the ground is not wet. The ground is wet. Therefore, it must be raining. (Valid or Invalid?)
5. If all swans are white, then any swan that is not white does not exist. (True or False?)
6. If $x > 3$, then $x + 2 > 5$. (True or False?)
7. If the moon is made of cheese, then the earth is flat. The earth is not flat. Therefore, the moon is not made of cheese. (Valid or Invalid?)
8. If John is a bachelor, then John is unmarried. John is unmarried. Therefore, John must be a bachelor. (Valid or Invalid?)
9. If a triangle has three equal sides, then it is equilateral. This triangle is equilateral. Therefore, it must have three equal angles. (Valid or Invalid?)
10. If A is true, then B is true. If B is true, then C is true. Therefore, if A is true, then C is true. (Valid or Invalid?)

Me:

Is problem 2 false?¹

GPT:

Problem 2 is true. The argument is in the form of a conditional statement, with the first premise being "If it rains today, then the streets will be wet" and the second premise being "If the streets are wet, then it must have rained." The

¹ I ask this question because I'm reading the statement thus: If it rains today, then the streets will be wet; therefore, if the streets are wet, then it must have rained. Given that I asked about entailment, I'm assuming that GPT provided problems in that structure. I'm expecting it to be false because of the problem is characterized as in the above, then we have an example of Affirming the Consequent Fallacy.

conclusion that follows is that if the streets are wet, then it must have rained today. This conclusion is logically valid, as it follows from the premises using the rule of modus ponens.²

Me:

Can you explain further how problem 2 is true?³

GPT:

Sure! In problem 2, we have two conditional statements:

- If it rains today, then the streets will be wet.
- If the streets are wet, then it must have rained.

The first statement asserts a necessary condition: if it rains, then the streets will be wet. The second statement asserts a sufficient condition: if the streets are wet, then it must have rained.

If we combine these two statements, we get a biconditional statement:

- It rained today if and only if the streets are wet.

This is a logically valid conclusion, which follows from the premises using the rule of equivalence of biconditionals. Therefore, problem 2 is true.⁴

Me:

So you're saying both statements can be true at the same time.⁵

GPT:

Yes, that's correct. Both statements in problem 2 can be true at the same time, and the conclusion that follows from them is also true.

² Here I find that GPT is forming the statement differently. The two statements are said to be premises to an implicit conclusion that is identical to premise 2.

³ I fail to understand what's happening at this point. I read GPT's response as a blatant fallacy, which of course surprises me.

⁴ GPT is still operating with the structure of two premises leading to a conclusion that initially implied, but here the conclusion is said to be a biconditional formed from the two implications.

⁵ Here I'm trying to establish that GPT is saying both statements CAN be true instead of that they MUST be true as this would clear up the fallacy. Again, I'm not fully understanding GPT's structure at this point.

If it rains today, then the streets will be wet, and if the streets are wet, then it must have rained. Therefore, if the streets are wet, then we can logically conclude that it rained today. However, if the streets are not wet, then we cannot conclude anything about whether or not it rained, as there could be other reasons why the streets are dry.

It's important to note that the truth of the premises and conclusion in an argument does not necessarily depend on whether or not the statements correspond to reality. In other words, an argument can be logically valid even if the statements are not factually correct. In this case, the logic of the argument is valid, regardless of whether or not it rained or the streets are wet.⁶

Me:

Can one be true and the other false at the same time?

GPT:

No, it is not possible for both statements in problem 2 to be false at the same time.⁷

The first statement asserts that if it rains today, then the streets will be wet. This statement is true, as rainwater will typically make the streets wet.

The second statement asserts that if the streets are wet, then it must have rained. This statement is also true in most cases, as rainwater is a common cause of wet streets. However, there could be other causes of wet streets, such as a burst water main or a street cleaning truck spraying water.

Therefore, it is possible for the first statement to be true and the second statement to be false (e.g., if the streets are wet due to a cause other than rain), but it is not possible for both statements to be false at the same time. If both statements are false, then it would mean that it did not rain and the streets are not wet, which contradicts the common sense experience that rain causes wet streets.⁸

⁶ GPT once again states the implied conclusion from before. However, there seems to be an error here: the premises are taken to form a biconditional together, yet GPT says if the streets aren't wet we can't know anything about whether it rained. This is not true!

⁷ Given the implied conclusion from the beginning, this is correct.

⁸ I think I see what GPT is after, but I really don't get how this makes sense.

Me:

So I could not say the first statement entails the second statement.

GPT:

No, it would not be accurate to say that the first statement in problem 2 entails the second statement.

For one statement to entail another, it must be the case that the truth of the first statement logically implies the truth of the second statement. In other words, if the first statement is true, then the second statement must also be true.

In problem 2, the first statement asserts that if it rains today, then the streets will be wet. This statement is true, but it does not logically imply the truth of the second statement, which asserts that if the streets are wet, then it must have rained. While the second statement is also true in many cases, it is not necessarily true in all cases.⁹

Therefore, we cannot say that the first statement entails the second statement. However, we can say that the conjunction of the two statements (i.e., "If it rains today, then the streets will be wet, and if the streets are wet, then it must have rained") entails the conclusion that if the streets are wet, then it must have rained today.

Me:

Would the error be called Affirming the Antecedent?

GPT:

In problem 2, affirming the antecedent is a valid deductive inference that allows us to derive the conclusion from the premises.

Affirming the antecedent is a rule of inference that says if a conditional statement (i.e., an "if-then" statement) is true and we know that the antecedent (the part that comes after "if") is true, then we can logically conclude that the consequent (the part that comes after "then") is also true.

In problem 2, the first premise is a conditional statement: "If it rains today, then the streets will be wet." The second premise asserts the truth of the antecedent:

⁹ Finally GPT and I are on the same page. I'm unsure how the misunderstanding occurred to begin with. The way GPT formed problem 2 was bizarre to begin with.

"The streets are wet." Therefore, by affirming the antecedent, we can logically conclude that the consequent must also be true: "It rained today."

So, in summary, the error of affirming the antecedent is not a mistake in problem 2, but rather a valid rule of inference that allows us to derive the conclusion from the premises.

Me:

So would it be called Affirming the Consequent?

GPT:

No, it would not be accurate to call the inference in problem 2 "Affirming the Consequent".

Affirming the consequent is a common fallacy in which one mistakenly infers the truth of the antecedent of a conditional statement from the truth of the consequent. For example:

- If it rained today, then the streets will be wet.
- The streets are wet.
- Therefore, it must have rained today.

This is a fallacy because there could be other reasons why the streets are wet besides rain, and the second premise does not provide any information about the antecedent.

In problem 2, however, we are not affirming the consequent. Instead, we are using a valid rule of inference called modus ponens, which allows us to infer the consequent of a conditional statement from the truth of the antecedent.

Therefore, we would not call the inference in problem 2 "Affirming the Consequent". Instead, we would say that the argument uses modus ponens to derive the conclusion from the premise.