

PHIL2642: Critical Thinking

Practice Exercises on Conditionals and Deduction

Questions and Answers in this document

1 (i) State the necessary and sufficient condition of each of these conditional claims. Rewrite the claims in the form of "If ... then ...".

(ii) Give an example of something which would be a counterexample to each of these claims. If an counterexample is impossible, say why.

- a) Every spider has venom.
- b) You won't die of lung cancer if you don't smoke.
- c) Only people who aren't Muslims drink alcohol.
- d) All voters in Australian federal elections are people over 18 years old.
- e) It is only Melbournians who don't like Sydney.
- f) If volunteer fire fighters were paid by the Government it would put too much strain on the budget.
- g) Only if Australia accepts more refugees will we not be internationally criticised.
- h) It's not an episode of keeping up with the Kardashians if it doesn't have numerous meaningful pauses.
- i) Only if it's black and chewy is it liquorice.
- j) All people who are working legally in Australia have a tax file number.

2) State the necessary and sufficient conditions for the conditional claim in these arguments. What is the form of each of the arguments? Is this a valid form or an invalid form?

- a) If you contribute at your job you'll be appreciated. You did contribute, so you will be appreciated.
- b) If you are irritating me I can't be held responsible for what I do. You are not irritating me, so I can be held responsible for what I do.
- c) If a dog isn't trained from when it's a puppy, it not be a well behaved adult. Sandy is a very well behaved dog, so he must have been trained from when he was a puppy.
- d) Spot is a dog, and since only human beings are moral agents, Spot can't be a moral agent.
- e) All members of the household buy groceries, but John isn't a member of the household. Therefore John doesn't buy any groceries.
- f) Only those who are not vegetarian eat meat. John eats meat, so he is not a vegetarian.

- g) Sonia did not pass the exam. Since everyone who did not study did not pass, we can conclude that she did not study.

Answers and explanations

1

- a) The sufficient condition is "it is a spider".

The necessary condition is "it is venomous".

If it's a spider, then it has venom.

Counterexample: a non-venomous spider.

In all of these questions, the counterexample is something which has the sufficient condition but which fails to have the necessary condition.

- b) The sufficient condition is "You don't smoke".

The necessary condition is "You won't die of lung cancer".

If you don't smoke, then you won't die of lung cancer.

Counterexample: Someone who didn't smoke but did die of lung cancer (or, someone who does not smoke but will die of lung cancer)

- c) The sufficient condition is "You drink alcohol".

The necessary condition is "You are not a Muslim".

If you drink alcohol, then you are not a Muslim.

Counterexample: Someone who is a Muslim who drinks alcohol.

- d) The sufficient condition is "You are a voter in an Australian Federal election".

The necessary condition is "You are over 18 years old".

If someone is a voter in an Australian Federal election, then they are over 18 years old.

Counterexample: a voter in this election who is only 17 years old. This is illegal but possibly it could happen if there were voter fraud.

- e) The sufficient condition is "You dislike Sydney".

The necessary condition is "You are a Melbournian".

If you dislike Sydney, then you are a Melbournian.

Counterexample: someone who's from Brisbane, not Melbourne, who dislikes Sydney.

- f) The sufficient condition is "The government paying volunteer fire-fighters".

The necessary condition is "putting too much strain on the budget".

If volunteer fire-fighters were paid by the Government, then this would put too much strain on the budget.

Counterexample: A situation in which the Government pays the fire-fighters but does not put too much of a strain on the budget, e.g. because it does not pay them very much, or because it manages to raise tax revenue to cover the cost, or because it lowers Government expenditure elsewhere.

- g) The sufficient condition is "Australia not being internationally criticised".
The necessary condition is "Australia accepting more refugees".
If we are to not be internationally criticised, then Australian will have to accept more refugees.

Counterexample: Australia not being internationally criticised, while still not accepting more refugees.

- h) The sufficient condition is "It does not have numerous meaningful pauses".

The necessary condition is "It is not an episode of Keeping Up with the Kardashians".

If it does not have numerous meaningful pauses, then it is not an episode of Keeping Up with the Kardashians.

Counterexample: an episode of Keeping Up with the Kardashians which doesn't have numerous meaningful pauses.

- i) The sufficient condition is "it is liquorice".

The necessary condition is "it is black and chewy".

If it's liquorice, then it's black and chewy.

Counterexample: some red liquorice.

- j) The sufficient condition is "You are working legally in Australia".

The necessary condition is "you have a tax file number".

If a person works legally in Australia, then they have a tax file number.

Counterexample: someone working legally in Australia who doesn't have a tax file number.

2

- a) The sufficient condition is "You contributed at your job".

The necessary condition is "You are appreciated".

Affirming the sufficient condition. Valid.

Remember that the way to determine the form of the argument is to look at what happens in the non-conditional premise, not what happens in the conclusion of the argument. In this case, the non-conditional premise is "You did contribute". This is affirming the sufficient condition, and affirming the sufficient is a valid argument form, so the argument is valid. Remember that the crucial feature for labelling this kind of argument is what the premise is doing, *not* what the conclusion is doing. If you were to look at what the conclusion is doing (it is affirming the necessary condition) you might mistakenly think that the argument is invalid.

- b) The sufficient condition is "You are irritating me".

The necessary condition is "I cannot be held responsible for what I do".

Denying the sufficient condition. Invalid.

In this argument, the non-conditional premise says the opposite, or "denies", the sufficient condition ("You keep irritating me"), so the argument denies the sufficient, and is therefore invalid.

- c) The sufficient condition is "It was not well trained from when it was a puppy".

The necessary condition is "It is not a well behaved adult dog".

Denying the necessary. Valid.

- d) The sufficient condition is "You are a moral agent".

The necessary condition is "You are a human being".

Denying the necessary condition. Valid.

In this question, the non-conditional premise is put first, then the conditional one. Also, the non-conditional premise, "Spot is a dog" does not use the same sort of wording as the necessary condition "being a human being", but it still clear that this is a denial of the necessary condition, for if something is a dog it is not a human being.

- e) The sufficient condition is "You are a member of the household".

The necessary condition is "You buy groceries".

Denying the sufficient condition - invalid.

The arguer asserts that all members of the household buy groceries, does not claim that only members of the household buy groceries. It is possible that the premises of this argument are true but that mean that non-members, such as John, also buy groceries.

- f) The sufficient condition is "You eat meat".

The necessary condition is "You are not a vegetarian".

Affirming the sufficient condition. Valid.

- g) The sufficient condition is "You did not study".

The necessary condition is "You did not pass the exam".

Affirming the necessary. Invalid.

In this argument, although the non-conditional premise, "Sonia didn't pass" is a negative statement, this does not mean that it is denying the necessary. The necessary condition "You did not pass the exam" is also a negative statement, so the (negative) non-conditional premise actually affirms this negative statement. The argument is clearly invalid. The conditional premise states that all those who don't study won't pass, but the truth of this claim is compatible with there being other reasons why someone might not pass (for example, not turning up to the final exam). So it would be possible for these premises to be true but the conclusion false.

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