PHIL2642: Critical Thinking

Lecture 3

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Week 5 test

- You will be doing an online assessment quiz at 10am Sydney time on Thursday 1st September. This will take up the first hour of our lecture that week.
- It is a one hour test worth 20% of your final mark. Most questions are multiple choice, some are short answer.
- The quiz will become available on the Canvas website for PHIL2642 at 10am Sydney time. You need to be set up somewhere with good internet where you can work uninterrupted for 1 hour. You can find the test by clicking on Quizzes.

- You need to prepare for this test by reading over the lecture notes, doing the tutorial exercises, and doing the practise exercises on the unit webpage.

Deductive Validity

- An argument is deductively valid if and only if the truth of the premises guarantees the truth of the conclusion.
- i.e. It is impossible for the premises to be true yet the conclusion false.
- If the premises were true, then the conclusion would have to be true also.

- Here is one example of a deductively valid argument:

1. p
2. q

Therefore, p

Deductively valid conditional arguments

- Conditional arguments have as a premise a claim of the form “If p then q”.

- We are in the process of figuring out which conditional arguments are deductively valid and which are invalid.

- When it comes to conditional arguments, we can think of validity as the “good form” component of soundness. A sound argument must have only true premises and must be deductively valid.

Valid conditional arguments

- The valid forms are:

Affirming the sufficient condition

If p then q

p

q

Denying the necessary condition

If p then q

Not q

Not p

Flipping around a conditional

- The argument form “Denying the necessary” gives us a neat way to change the order of conditions in a conditional claim while preserving the meaning of the conditional claim. In order to do so we need to insert “not” twice.
- We’ve already seen that “If p then q” does not mean the same thing as “If q then p”.
- But look what happens when we assert “If p then q” then consider what would be the case if we deny the necessary.
- We get: “If not q then not p”
- “If p then q” = “If not q then not p”
- If you are a father then you are a parent = If you are not a parent then you are not a father.

Mnemonic

- To help you remember the valid forms of conditional argument, note that their abbreviations, “aff suff” and “den nec” both repeat a letter in their first and second words.

- In “aff suff” there are two fs in the first and two fs in the second words, and in “den nec” the n is to be found in both the first and second words.

- This is not explanatory! It is just a memory trick to help you.

Invalid conditional arguments

- Affirming the necessary condition.

If p then q.

q

Therefore p

If I am a father, then I am a parent.

I am a parent.

Therefore, I am a father.

When an argument is invalid you should be able to imagine circumstances in which the premises are true but the conclusion is false.

Examples of Affirming the Necessary

If you are in Berlin then you are in Germany.

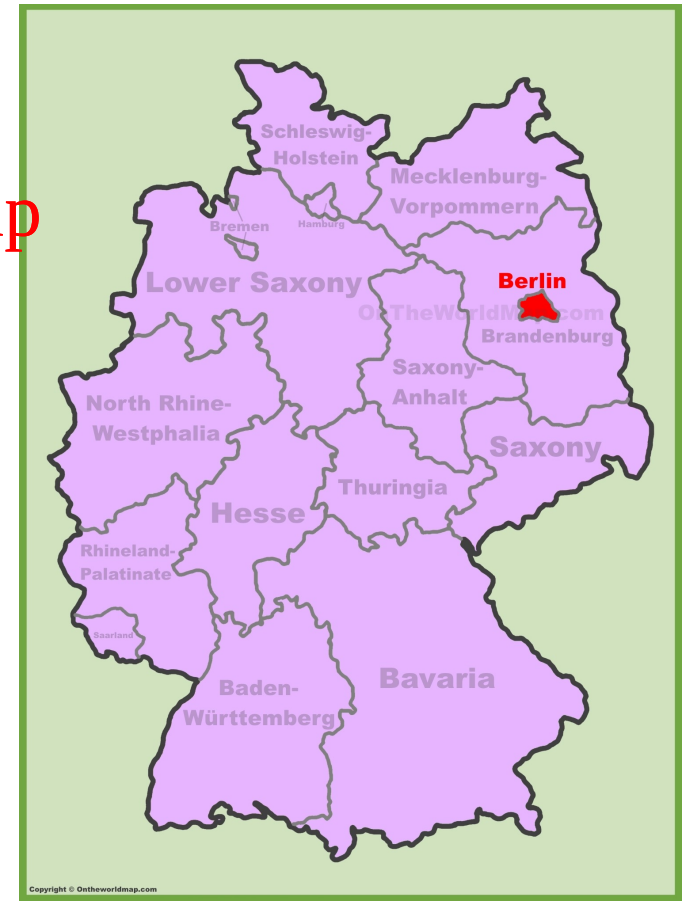
You are in Germany.

Therefore you are in Berlin.

If it is a human then it is a primate.

Koko is a primate.

Therefore, Koko is a human.



Denying the sufficient condition

If p then q.

Not p

Therefore not q

If it is a square then it has four sides and four right angles.

This shape is not a square.

Therefore this shape does not have four sides and four right angles.

Examples of denying the sufficient

If there is a tiger at the zoo, then I'll go to the zoo.

There is no tiger at the zoo.

Therefore I won't go to the zoo.

"The campaign …theme concentrated on the safety benefits of wearing helmets and the campaign slogan was, "If you don't need a head, You don't need a helmet"."

If you don't need a head, then you don't need a helmet.

You do need a head.

Therefore, you do need a helmet.

What they should have said is "If you need a head, then you need a helmet", or "If you don't need a helmet, then you don't need a head".

Invalid conditional arguments

Affirming the necessary condition.

If p then q.
q_____
Therefore p

Denying the sufficient condition

If p then q.
Not p_____
Therefore not q

Mnemonic

- In contrast to the valid forms of conditional argument, aff suff and den nec, the invalid forms do not have matching f's and n's in their names: "aff nec" and "den suff".

- Matching letters good.
- No matching letters bad.

Conditional Arguments of Many Forms

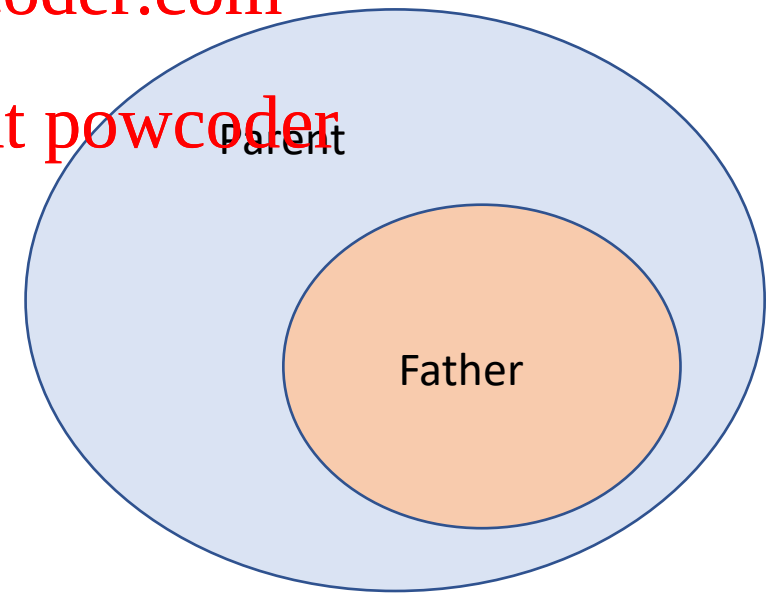
- **Only citizens of Spain know how to speak Spanish.**
- **Isabella is a citizen of Spain.**
- **Therefore, Isabella knows how to speak Spanish.**

- Translate the conditional claim into the "if p then q" form.
- Has the arguer said "If you are a citizen of Spain then you know how to speak Spanish"?
- Or has the arguer said "If you know how to speak Spanish then you are a citizen of Spain?

How to check

- Remember, “If you are a father, then you are a parent” can be translated into “All fathers are parents”.
- “If you are a father, then you are a parent” can be also be translated into “Only parents are fathers”.

- So, “Only citizens of Spain can speak Spanish” is translated as “If you speak Spanish then you are a citizen of Spain”.



Is it valid?

- **“Only citizens of Spain can speak Spanish” = If you can speak Spanish the you are a citizen of Spain.**

If you can speak Spanish then you are a citizen of Spain.

Isabella is a citizen of Spain.

Therefore, Isabella can speak Spanish.

Affirming the necessary. Invalid.

What is the form of this argument?

Compare it to this different argument:

All citizens of Spain can speak Spanish.

Isabella is a citizen of Spain.

Therefore, Isabella can speak Spanish.

Affirming the sufficient. Valid.

Valid or Invalid?

- **Only idiots think that Morocco is in Europe.**
- **Dave thinks that Morocco is in Europe.**
- **Therefore, Dave is an idiot.**
- Aff suff. Valid.

- **You will be punished if you stole from the shops.**
- **You did not steal from the shops.**
- **Therefore, you will not be punished.**
- Den suff. Invalid.

Valid or Invalid?

All hamburgers are made in the town of Hamburg, Germany.

This item of food was made in the Wentworth Building, Sydney Uni.

Therefore, this item of food is not a hamburger.

Den nec. Valid.

Every example in this lecture is easy to understand.

This is not easy to understand.

Therefore, this is not an example in this lecture.

Den nec. Valid.

Tricky question

- If an argument is deductively valid but has a false conclusion, what can we infer about its premises?
- At least one of the premises is false. Which one?

- **Every example in this lecture is easy to understand.**
- **This is not easy to understand.**
- **Therefore, this is not an example in this lecture.**

Soundness

The best kind of deductive argument, which really does guarantee the truth of its conclusion, is an argument that is **sound**. It must possess two features in order to be sound:

1) It must have only true premises (all of its premises must be true).

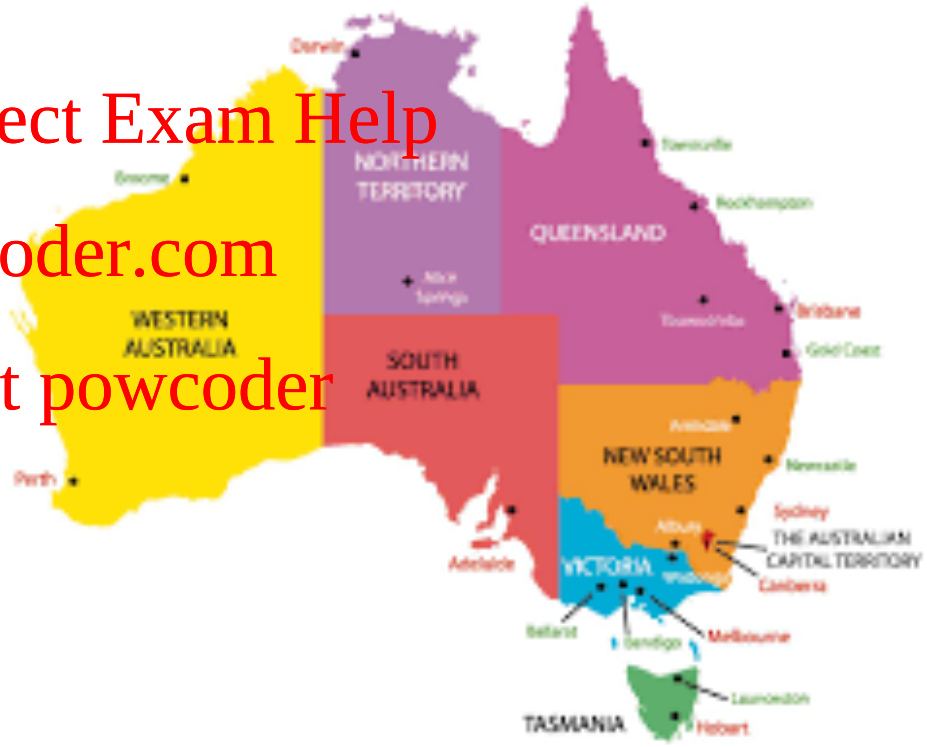
2) It must be valid.

- **Every member of Luke's family grew up in Sydney.**
- **Kanye West is not a member of Luke's family.**
- **Therefore, Kanye West did not grow up in Sydney.**

- Both premises are true, but denies the sufficient, so is invalid and hence not sound.

Examples

- **If Sydney is in Queensland, then Sydney is in Australia.**
- **<u>Sydney is in Queensland.</u>**
- **Therefore, Sydney is in Australia.**



Aff suff, so it is valid.

But not sound because premise 2 is false.

Questions

- **If you are a farmer, you own at least one horse.**
- **Bob does not own a horse.**
- **Therefore, Bob is not a farmer.**
- Valid (den nec) but premise 1 is false, so it is not sound.

- **You are a member of parliament only if you are a human being.**
- **Anthony Albanese is a member of parliament.**
- **Therefore, Anthony Albanese is a human being.**
- Valid (aff suff) and only true premises, so it is sound.

Is it Sound?

- **If going to war ultimately will bring peace and prosperity, we should go to war.**
- **Going to war ultimately will bring peace and prosperity.**

- **Therefore, we should go to war.**

- Often validity gets us nowhere!

We need to know whether the premises are true.

When two people accept the same conditional claim, how will they argue?

- One person's modus ponens is another person's modus tollens.

- **Modus ponens (affirming the sufficient):**

If p then q
p
Therefore, q

- **Modus tollens (denying the necessary):**

If p then q
Not q
Therefore, not p

Example

- Jesus said that he is Lord, says C. S. Lewis.

- If what Jesus said was wrong, then he was a lunatic or a liar.

- But Jesus was not a lunatic or a liar.
- Therefore, Jesus is Lord. (**Modus Tollens**)

- If what Jesus said was wrong, then he was a lunatic or a liar.
- What Jesus said was wrong.
- Therefore, Jesus was a lunatic or a liar. (**Modus Ponens**)

Modus Ponens or Modus Tollens?

- Suppose that Molly and Polly agree that, if a foetus is a person, then abortion is impermissible. Suppose that Molly is more convinced that abortion is permissible, and Polly is more convinced that a foetus is a person. Molly will use Modus Tollens:

If a foetus is a person, then abortion is impermissible.

Abortion is permissible.

Therefore, a foetus is not a person.

Polly will use Modus Ponens:

If a foetus is a person, then abortion is impermissible.

A foetus is a person.

Therefore, abortion is impermissible.

Structuring Options re. Free Will

1. Our actions are free.
2. If an action was free, then the agent could have done otherwise.
3. Determinism is true, so no event (including actions) could have been otherwise.

Modus ponens (affirming the sufficient):

- **If my action is free, then I could have done otherwise.**
- **I freely came to this lecture.**
- **Therefore, I could have done otherwise**
- The conclusion implies that determinism is false.

Modus tollens (denying the necessary):

- **If my action is free, then I could have done otherwise.**
- **Determinism is true (so I could not have done otherwise).**
- **Therefore, none of my actions are free**
- This conclusion is known as “hard determinism”

Another option

- But there is another option here. Some philosophers think we should reject the conditional claim:

- **My actions are free.**

- **Determinism is true (so I could not have done otherwise).**

- **Therefore, it is not the case that if my action is free, then I could have done otherwise.**

- This is compatibilism about free will.

Disjunctive Deductive Arguments

- A disjunction is a claim of the form "p or q". Each part of a disjunction is called a "disjunct". In this case, one disjunct is p and the other disjunct is q.

- The word "or" is ambiguous, i.e. it has more than one meaning.

- Some disjunctions are **inclusive disjunctions**, which mean "p or q and possibly both p and q".
- Other disjunctions are **exclusive disjunctions**, which mean "p or q but not both p and q".

Examples

- e.g. Suppose we are going on holidays to Canberra. You ask, “What can we do in Canberra?”. I say to you “We could go to the National Gallery, or we could visit Parliament House.”
- This means “either p or q and possibly both p and q”. **Inclusive disjunction.**

- e.g. Either you’ve heard James Brown before or you’ve never heard him before. **Exclusive disjunction.**
- e.g. We are leaving now. Either you are coming or you are staying. **Exclusive disjunction.**

Which kind of disjunction?

- **You can have the Cadbury's showbag or the Darrell Lea showbag BUT NOT BOTH!**

Which kind of disjunction?

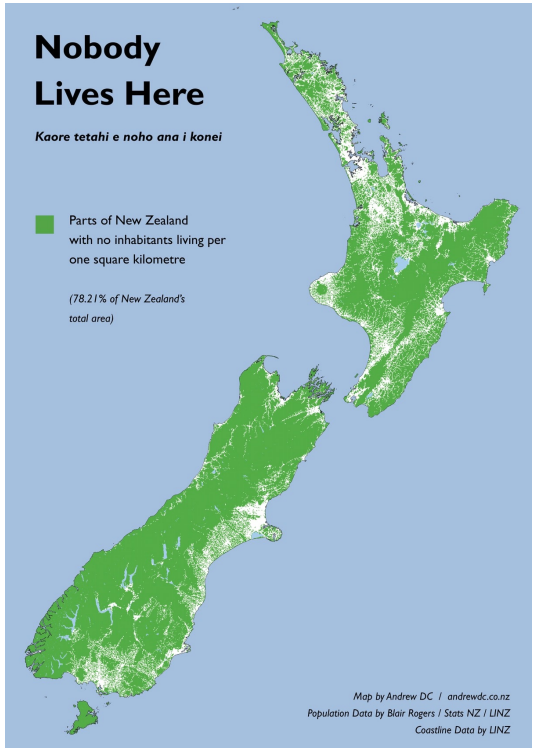
- **You can have pork dumplings, or seafood dumplings, or sticky rice, or pork buns, or rice noodles. In fact, you can have all of them.**

Inclusive Disjunctions

- With **inclusive disjunctions**, there is a standard form of argument that is deductively valid:
- **p or q**
- **Not p**
- **Therefore q**

- Equally, this could be:
- **p or q**
- **Not q**
- **Therefore p**

- **When you visited New Zealand you went to the North Island or the South Island.**
- **When you visited NZ you did not go to the South Island.**
- **Therefore, you went to the North Island.**



Invalid form

- Note that arguments featuring inclusive disjunctions are invalid if they have the following form:

- **p or q**
- **p**
- **Therefore not q**

You like pizza or you like burritos.

You like pizza.

Therefore, you do not like burritos.

Exclusive disjunctions

- With **exclusive disjunctions**, which mean "p or q but not both p and q", there are two forms of argument that are valid.

- The first valid form is:
- **p or q**
- **Not p**
- **Therefore q**

- and an equivalent argument:
- **p or q**
- **Not q**
- **Therefore p**

Exclusive disjunctions

The second valid form is:

- **p or q**
- **p**
- **Therefore not q**

and an equivalent argument:

- **p or q**
- **q**
- **Therefore not p**

Examples

- **Either you've heard James Brown before or you have never heard him.**
- **You've heard James Brown before.**
- **Therefore, it's not the case that you have never heard James Brown.**

- **Either you are leaving the party or you are staying.**
- **You are leaving the party.**
- **Therefore, you are not staying.**

Invalid forms

- **p or q**
- **Not p**
- **Therefore, not q**

or

- **p or q**
- **p**
- **Therefore q**

- **Bob Marley was born in Jamaica or in England.**
- **Bob Marley was born in Jamaica.**
- **Therefore, Bob Marley was born in England.**

Valid? Sound?

- **The next corner you take will be a right or a left.**
- **The next corner you will take is a right.**
- **Therefore, the next corner you will take is not a left.**

- **Adam has a library card or Susie has a library card.**
- **Adam has a library card.**
- **Therefore, Susie does not have a library card.**

Material inference

- An argument whose validity relies purely on its form (as expressed with ps and qs and logical connectives) is sometimes referred to as a **formal inference**. Conditional arguments are formal inferences.
- An argument whose validity also depends on things other than form is sometimes referred to as a **material inference**.
- Is it valid? Ask: Would the truth of the premises guarantee the truth of the conclusion.

1. Russia is bigger than India.

2. India is bigger than France.

Therefore, Russia is bigger than France.

- This is valid, because the relation of being bigger than is **transitive**. i.e. If a is bigger than b and b is bigger than c then a is bigger than c.

More material inferences

- **1. Bobby-John loves Mary-Lou.**
- **2. Mary-Lou loves Billy-Joe.**
- **Therefore, Bobby-John loves Billy-Joe.**
- Invalid, because loving is not transitive, hence we have wars.

- **1. One Australian dollar equals 100 Australian cents.**
- **Therefore, 100 Australian cents equals 1 Australian dollar.**

- Valid. The relation of being equal to is a **symmetrical**, i.e. If a is equal to b then b is equal to a.

- **1. Bobby-John loves Mary-Lou.**
- **Therefore, Mary-Lou loves Bobby-John.**
- Invalid. Loving is not symmetrical, hence we have broken hearts, and country music.

Questions: Valid? Sound?

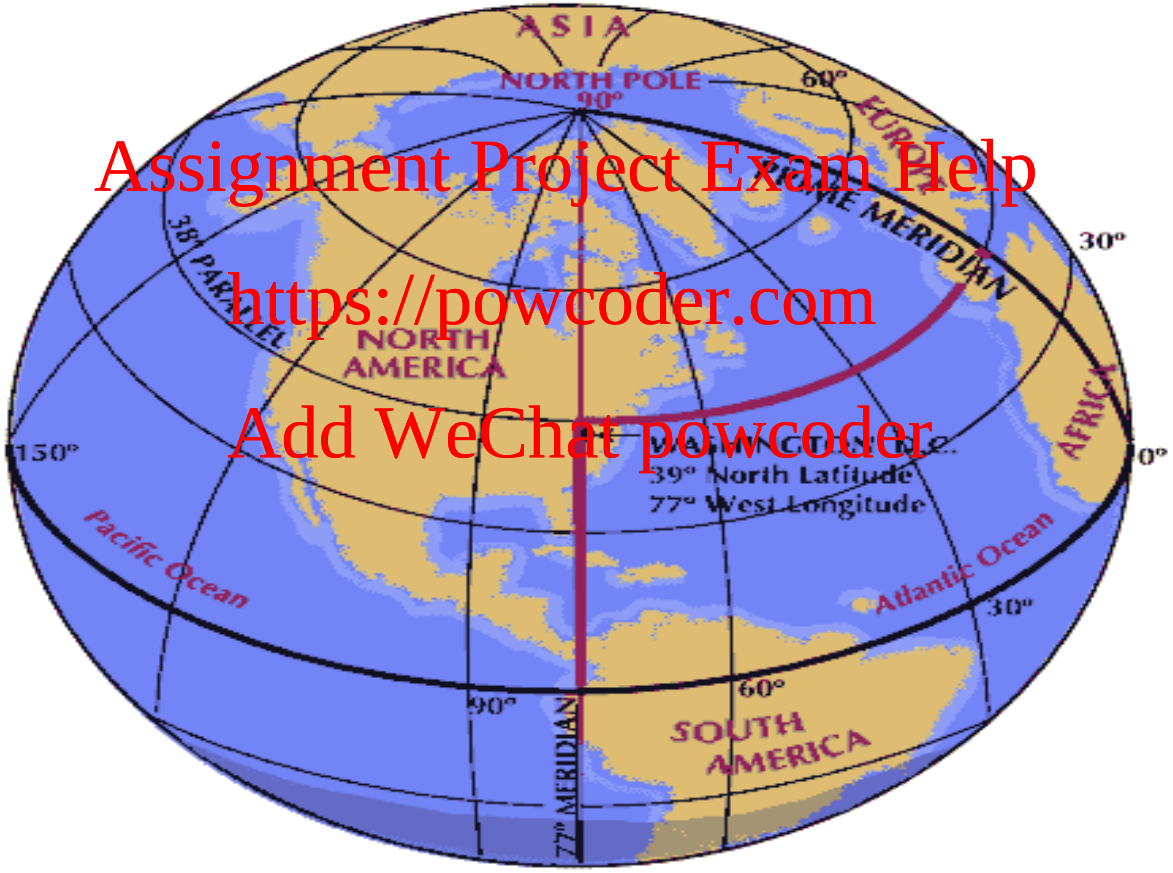
- **1. The ticket costs one Australian dollar.**
- **2. One Australian dollar equals 200 Australian cents.**
- **Therefore, the ticket costs 200 Australian cents.**

- **1. Adelaide is West of Sydney.**
- **2. Perth is West of Adelaide.**
- **Therefore, Perth is West of Sydney.**

Is the “west of” relation transitive?

- **1. Adelaide is West of Sydney.**
- **2. Perth is West of Adelaide.**
- **3. Cape Town is West of Perth.**
- **4. Buenos Aires is West of Cape Town.**
- **5. Easter Island is West of Buenos Aires.**
- **6. Auckland is West of Easter Island.**
- **C: Auckland is West of Sydney.**

Is the “North of” relation transitive?



More complex arguments

- **The only way to get into the storeroom is to open the lock or break the lock. The thief got into the storeroom and the lock was not broken. All members of the club can open the lock on the store room. Since Dave is not a member of the club, he could not have opened the lock. Therefore, Dave is not the thief.**

- How can we analyse this argument? First. find the ultimate conclusion:

- **C: Dave is not the thief.**

Example

- What are the main premises that support this conclusion?

- **P1: The thief opened the lock (If someone is the thief then he opened the lock).**
- **P2: Dave could not have opened the lock. (Dave did not open the lock.)**
- **C: Dave is not the thief.**

- This part of the argument is valid. It denies the necessary.

Example

- What subpremises are offered in support of the main premises? Let's think first about P1. The relevant part of the argument is:
- **The only way to get into the storeroom is to open the lock or break the lock. The thief got into the store and the lock was not broken.**

- We can rephrase the first of these claims as "**If the thief got into the storeroom then the thief opened the lock or broke the lock**". Another premise is that **the thief got into the storeroom**.

- **P1.1.1: If the thief got into the storeroom then the thief opened the lock or broke the lock.**
- **P1.1.2: The thief did get into the storeroom.**
- ***Therefore***
- **P1.1: The thief opened the lock or broke the lock.**

- The above subargument is valid. It affirms the sufficient.

Example

- There is another subpremise that combines with P1.1
- **P1.1: The thief opened the lock or broke the lock.**
- **P1.2: The lock was not broken (or, The thief did not break the lock)**
- ***Therefore***
- **P1: The thief opened the lock.**

- The above subargument is a disjunctive argument. It denies one of the disjuncts and affirms the other, so it is valid. (NB It does not matter whether it is an inclusive or exclusive disjunction in this case, as this form is valid for both kinds of disjunctive argument.)

Example

- How about the subargument in support of P2? Here the relevant part of the original argument is: **All members of the club can open the lock on the store room. Since Dave is not a member of the club, he could not have opened the lock.** This contains a conditional deductive argument.
- **P2.1: All members of the club can open the lock on the store room.**
- We could translate this into the standard "If p then q" form:
- **P2.1: If you are a member of the club then you can open the lock on the store room.**
- **P2.2: Dave is not a member of the club**
- ***Therefore***
- **P2: Dave could not have opened the lock**

Denies the sufficient. Invalid.

Example

P1.1.1: If the thief got into the storeroom then the thief opened the lock or broke the lock.

P1.1.2: The thief did get into the storeroom.

P1.1: The thief opened the lock or broke the lock.

P1.2: The lock was not broken (or, The thief did not break the lock)

P1: The thief opened the lock (or, If someone is the thief then he opened the lock).

P2.1: If you are a member of the club then you can open the lock on the store room.

P2.2: Dave is not a member of the club.

P2: Dave could not have opened the lock.

C: Dave is not the thief.