PHIL2642 Critical Thinking

Lecture 2

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Tutorials

- Tutorials are running. In tutorials you will be working through exercises relating to the immediately preceding lecture.

- **Tutorials**
- Thursday 1-2pm in S421 in the Quadrangle
- Thursday 2-3pm in S225 in the Quadrangle
- Friday 1-2pm online
- Friday 2-3pm online

Critical Thinking

- How do we learn critical thinking?
- Not via the method of epiphany! I am not going to tell you "the secret", or give you sudden insight.

- If we want to improve our reasoning skills, we learn by doing. Repetition with variation.

- We acquire a disparate set of skills one by one, then we begin to apply all of these skills together in more complex, real life scenarios.
- What we are doing might sometimes seem boring and a bit techy, but you can't reason clearly about big, exciting issues like climate change, the existence of God, freedom of speech, etc. unless you have mastered the basics.

You need to concentrate and participate! Turn off your distracting devices!

Convergent v. Linked Premises

- **Linked premises are interdependent, and support the conclusion only if taken together.**
- **Convergent premises are independent, and each on its own provides some support for the conclusion. e.g.**

- **1. Trev knows how to catch fish.**
- **2. Trev knows how to start a fire.**
- **3. Trev is a friendly person.**
- **Conclusion: Trev would be a good companion if you were marooned on a desert island.**

Convergent v. Linked Premises

1. You have to get to Soho.

2. You can get to Soho only on the F train or on the R train.

3. The F train is not running.

Conclusion: You have to catch the R train.

- **1. Everybody in the room speaks English.**
- **2. Sarah is in the room.**
- **Conclusion: Sarah speaks English.**

Questions: Convergent or Linked?

- **1. Dogs are smarter than cats.**
- **2. Cats are smarter than rabbits.**
- **3. Rabbits are smarter than wombats.**
- **Conclusion: Dogs are smarter than wombats.**

- **1. Dogs are smarter than cats.**
- **2. Dogs are friendlier than cats.**
- **3. Dogs keep away burglars.**
- **Conclusion: Dogs are better pets than cats.**

Implicit Premises: What is silently assumed?

- **He is much bigger than you, therefore you should not make him angry.**
- Premise 1: He is much bigger than you.
- Premise 2 (implicit): People who are much bigger than you could harm you when they are angry.
- Conclusion: You should not make him angry.

- In ascribing implicit premises, we should be guided by two things:
- The arguer's intentions (which we can often discern by asking her what she means, or by her related behaviour)
- A principle of charity (assume a premise that would help to make the argument stronger)

Other possible implicit premises

- **Premise 1: He is much bigger than you.**
- **Premise 2 (implicit): People who are much bigger than you have heart attacks when they get angry.**
- **Conclusion: You should not make him angry.**

- **Premise 1: He is much bigger than you.**
- **Premise 2 (implicit): People who are much bigger than you explode when they are angry.**
- **Conclusion: You should not make him angry.**

Which implicit premise?

- **Premise 1: He is much bigger than you.**
- **Premise 2 (implicit): People who are much bigger than you could harm you when they are angry.**
- **Premise 3 (implicit): You should not do something if it is likely to result in your being harmed.**
- **Conclusion: You should not make him angry.**

- Why is premise 2 above the most plausible implicit premise?
- How could you confirm this?

How do we assess arguments?

- First we need to recognise which form of argument is in play.
- Deductive? Inductive? Abductive? Causal? Analogical?

- Today we'll work up towards being able to recognise and assess some kinds of deductive argument.

- Some deductive arguments involve conditional claims. We will master conditionals then move on to deduction.
- NB This is probably the most difficult lecture! Don't panic.

Philosophical terminology

- Memorising terminology is part of the process of critical thinking.
- A proposition is what is said in a declarative sentence.
- “Snow is white” and “Schnee ist weiss”.
- “Europe is North of Africa” and “Africa is South of Europe”.

- In philosophy we use labels to stand for variables, as in algebra.

- Propositions: p q
- Objects: a b
- Properties: F G
- A basic proposition: a is F
- Complex propositions: a is F or a is G.
- p or q

Conditional Statements

- "**If p then q**", or any statements which have an equivalent meaning. e.g. "If you are a father then you are a parent".

- Often it is hard to tell the difference between conditional statements and causal statements or causal explanations. Sometimes people express causal explanations by saying if p then q.

- **e.g. Why is Tina drunk? Because if Tina drinks too much champagne, then Tina gets drunk.**

- But conditional claims should not be read as causal explanations. Rather, they are claims about what can be inferred from what. **"If p then q" doesn't mean "p makes q happen" or "p makes sense of q". Instead, it means "If p is true, then q is true".**

Conditionals

- **If it rained then the dam levels are higher.**

(p = it rained, and q = the dam levels are higher.)

- **If I am a father then I am a parent.**
- **If you are bigger than Arnie then you are bigger than me.**

- **If the dam levels are higher then it rained.**

(p = the dam levels are higher, and q = it rained)

Sufficient Condition

- **Sufficient condition.** For the standard form of conditional “If p then q”, the sufficient condition is p.
- Note that the sufficient condition is not “if p”. The word “if” is not part of the sufficient condition.
- Sometimes the sufficient condition is called the “antecedent”.
- In the claim “If q then p” the sufficient condition is p.

- e.g. **If you are a father then you are a parent.**
- The sufficient condition in this claim is "you being a father”, or “you are a father”.
- What is said is this: The fact that you are a father is enough to make it true that you are a parent. Being a father is sufficient for being a parent.

Find the sufficient condition

- **If you are a police officer then you are allowed to break the law.**
- The sufficient condition in this claim is “you are a police officer”.
- (This conditional claim is false.)

- **If the asteroid hits Earth tomorrow, everyone will die tomorrow.**
- The sufficient condition in this claim is “the asteroid hits the Earth tomorrow”.

Necessary Condition

- **Necessary condition.** For the standard form of conditional “If p then q”, the necessary condition is q.
- The necessary condition is not “then q”.
- Sometimes the necessary condition is called the “consequent”.
- In the claim “If q then p” the necessary condition is p.

- **e.g. If you are a father then you are a parent.**
- The necessary condition in this claim is "you are a parent".

Find the necessary condition

- **If you are a police officer then you are allowed to break the law.**
- The necessary condition in this claim is “you are allowed to break the law”.

- **If the asteroid hits Earth tomorrow, everyone will die tomorrow.**

- The necessary condition in this claim is "everyone will die tomorrow".

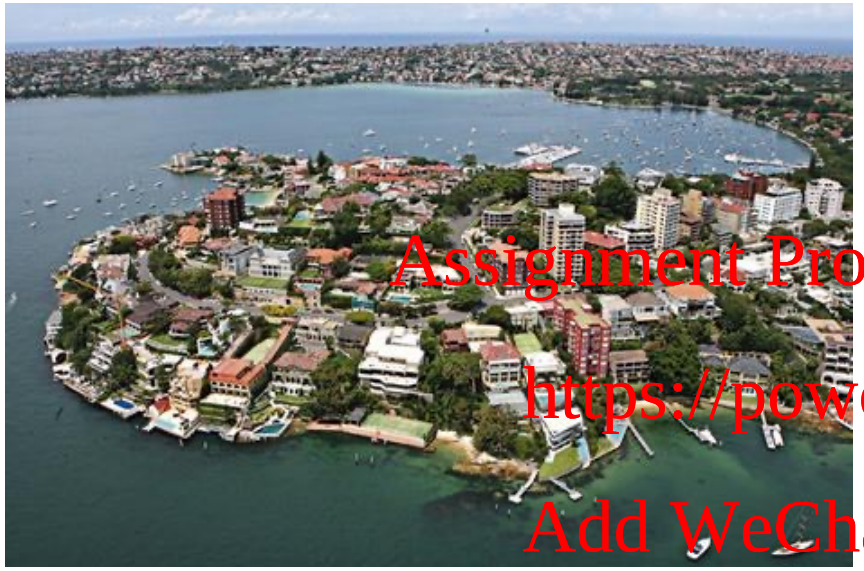
- If q then p.
- Nec: p. Suff: q

- If r then s.
- Suff: r Nec: s

Equivalent Forms of Conditionals

- Lots of claims of various forms turn out to be equivalent in meaning to the basic form of the conditional claim “**If p then q**”. (NB Here we are fixing on the value of p and q in the claim "if p then q")
- Let’s think this through using the true conditional claim “If you are a father then you are a parent”:
- **p is sufficient for q**
- **q is necessary for p**
- **q if p**
- **p only if q**
- **Only if q, then p**

If this suburb is more expensive than Point Piper then it is more expensive than Marrickville



- "If p then q" means…
- **p is sufficient for q**
- **q is necessary for p**
- **q if p**
- **p only if q**
- **Only if q, then p**

Mnemonic

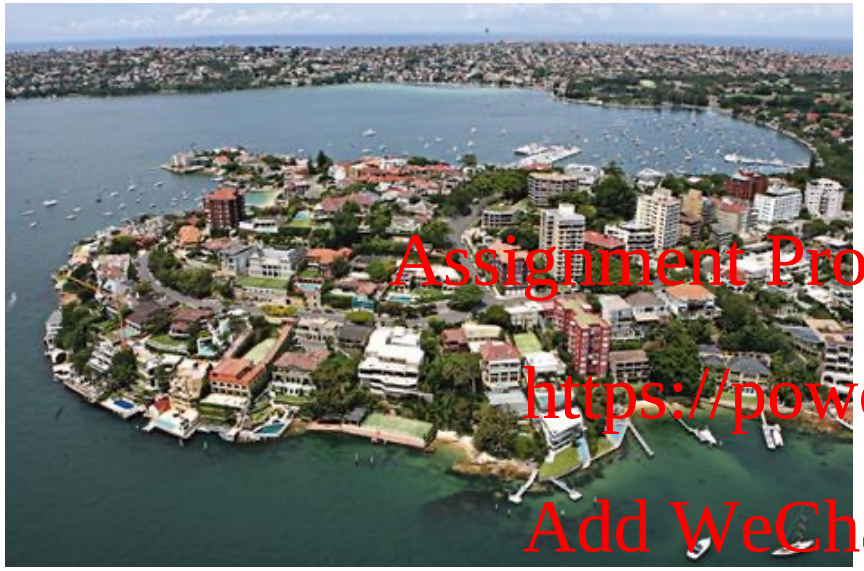
- We can see for the past three examples, that **the clause after an “if” is the sufficient condition, whereas the clause after an “only if” is the necessary condition.**

"All", "Every" and "Only" Generalisations

- Recall that 'a' and 'b' stand for objects or events and 'F' and 'G' stand for properties.
- Another common form of conditional statement is "**If a is F then a is G**".
- This is equivalent in form to "If p then q", where p = "a is F" and q = "a is G". This terminology allows us to translate some conditional claims into equivalent generalisations.

- **All Fs are Gs (also "Every F is a G")**
- **No Fs are non-Gs**
- **Only Gs are Fs**
- **The only Fs are Gs**

If this suburb is more expensive than Point Piper then it is more expensive than Marrickville



- "If a is F then a is G" means…
- **All Fs are Gs**
- **Every F is a G**
- **No Fs are non-Gs**
- **Only Gs are Fs**
- **The only Fs are Gs**

Generalisations

- What kind of necessity is in a generalisation?

- All Members of the Board are bald.

- All numbers greater than 7 are greater than 2.

- All electrons have a negative charge.
- All coloured objects are extended (i.e. take up space).
- All dogs have hair.
- All presidents of the USA are born in the USA.

Translations of Conditional Claims

If someone can smell food cooking then she is near a kitchen.

This is equivalent to:

- All people who can smell food cooking are near a kitchen.
- Only people who are near a kitchen can smell food cooking.

- Everyone who can smell food cooking is near a kitchen.
- People can smell food cooking only if they are near a kitchen.
- No people who can smell food cooking are not near a kitchen.
- Being near a kitchen is necessary for smelling food cooking.
- Smelling food cooking is sufficient for being near a kitchen.

More translations

- **If you eat no carbs then you lose weight.**

This is equivalent to:

- All people who eat no carbs lose weight.
- Only people who lose weight eat no carbs.
- Everybody who eats no carbs loses weight.
- People eat no carbs only if they lose weight.
- No people who eat no carbs do not lose weight.
- Losing weight is necessary for eating no carbs.
- Eating no carbs is sufficient for losing weight.

Common mistakes

- Some common mistakes that lead to mistranslation of conditional claims:

- e.g. **I am easy to see only if I am wearing a red jumper.**
- Many people are tempted to translate this as:

- "If I am wearing a red jumper then I am easy to see".

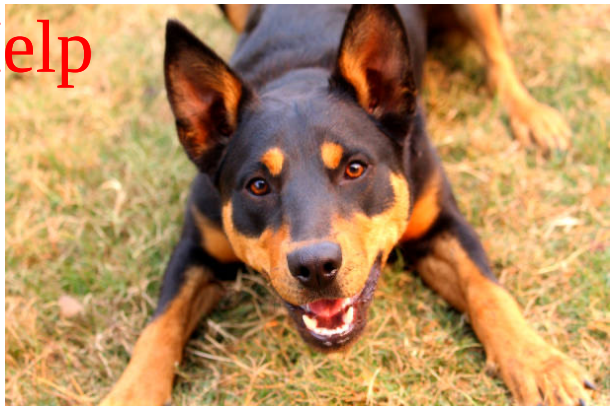
- The original claim is actually equivalent to the following claims:
- If I am easy to see then I am wearing a red jumper.
- I am wearing a red jumper if I am easy to see.
- Only if I am wearing a red jumper am I easy to see.

Mistranslating

- Suppose that Trev says "**Only kelpies are dogs**".

Trev's claims translates to:

- If it is a dog then it is a kelpie.
- Only if it is a kelpie is it a dog.
- All dogs are kelpies.



- SOME CONDITIONAL CLAIMS ARE FALSE.
- When you translate a conditional claim, preserve the meaning of that claim as stated. Don’t mistranslate it in order to say something true.

Counterexamples to Conditional Claims and Generalisations

- We can test the truth of a conditional claim by searching for a **counterexample** to the claim.
- In this unit, here is our rule: a counterexample to a conditional claims is a thing, event or state of affairs in which the sufficient condition is true but the necessary condition is false.

- A counterexample to “If p then q” is a case in which p is true and q is false.

Find a counterexample

- **Only if you are a student are you in this lecture.**
- **If you can drive on it directly from the Sydney CBD to the North Shore, then it is a bridge.**
- **If it is an ant, it is smaller than an elephant.**
- **If it is a triangle (in Euclidean space), then its angle sum is 180 degrees.**
- **If you are a bachelor then you are unmarried.**
- **If it is water then it is H2O.**

Falsifying Conditionals

- **Cards have numbers on one side and letters on the other. Consider the conditional claim "If a card has a D on one side, it has a 3 on the other". Which card/s would you have to turn over to test whether this claim is false? (Only turn over the cards that could show that the claim is false.)**

Truth of Conditional Claims

- We have seen that a conditional claim "If p then q" is false in cases in which p is true but q is false.
- **When are conditional claims true?**

- Maybe this: “If p then q” is true when p and q are true, and when p is false.

- But what about: "If you touch that wire you will be electrocuted”.

- In some cases in which p is false this claim seems true, but in other cases in which p is false, this claim seems false.

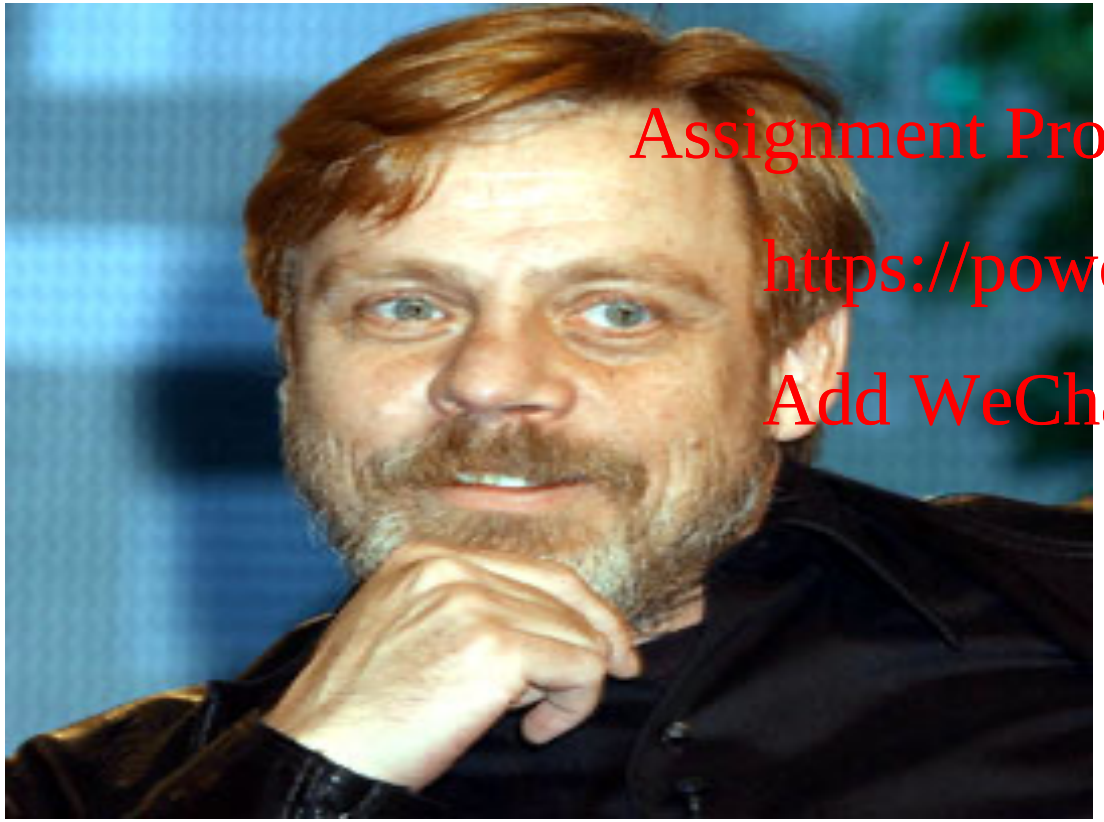
- This question is complicated.
- We will ignore it in this unit. You can go on to study it in more depth later.

Practice Questions on Conditionals

For each of the following conditional statements:

- Translate the statement into the "If … then …" form.
- Identify the sufficient condition and the necessary condition.
- If possible, give a counterexample to the statement. If it is not possible to give a counterexample, explain why.

Mark goes to the movies only if Star Wars is showing



Answer

- a) Mark goes to the movies only if Star Wars is showing.
- If Mark goes to the movies then Star Wars is showing.
- Suff con: Mark goes to the movies
- Nec con: Star Wars is showing
- Counterexample: Mark going to the movies when Star Wars is not showing.

More questions

- b) Being coloured is necessary for being red.
- If it is red, then it is coloured.
- Suff con: Being red (or "it being red", etc)
- Nec con: Being coloured
- Counterexample: A counterexample would be something that is red but is not coloured, but red is a colour, so there could be no such things. There are no actual nor possible counterexamples.

More questions

- c) All children are annoying.
- If it is a child then it is annoying.
- Suff con: It is a child
- Nec con: It is annoying
- Counterexample: A child who is not annoying

More questions

- d) Mum is going if Dad is going.
- If Dad is going then Mum is going.
- Suff con: Dad is going
- Nec con: Mum is going
- Counterexample: A case in which Dad is going but Mum is not going (or “A case in which Dad goes but Mum stays”)

More questions

- e) The only genuinely funny animals are monkeys.
- If it is a genuinely funny animal then it is a monkey.
- Suff con: Being a genuinely funny animal
- Nec con: Being a monkey
- Counterexample: A genuinely funny animal that is not a monkey.

A funny dog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A final question

- f) Being a mammal is sufficient for being a dog.
- If it is a mammal then it is a dog
- Suff con: Being a mammal
- Nec con: Being a dog
- Counterexample: A mammal that is not a dog, e.g. a cat.

Deduction

- Some arguments are deductive. Not all arguments are deductive. E.g Here is a non-deductive argument:

- 1. The price of gold has risen steadily over the past year.

- 2. Market analysts predict that it will rise further in the next six months.

- Therefore, the price of gold will rise in the next six months.

- **Deductive arguments are those arguments in which the truth of the premises is *intended* to *guarantee* the truth of the conclusion (and, perhaps, which possess a form that is similar to those arguments in which the truth of the premises does guarantee the truth of the conclusion).**

Soundness

It must possess two features in order to be a faultless deductive argument:

- **1) It must have only true premises.**
- **2) The truth of those premises must guarantee the truth of the conclusion.**

For many kinds of deductive argument, we can see these two demands as…

- 1) It must have good (i.e. true) content in its premises.
- 2) It must have good (i.e. truth-preserving) form.

- A deductive argument that possesses both of these features is known as a **sound** argument.

Validity & Invalidity

- What is it for a deductive argument to have good form? It is for that argument to be **valid**. As we have seen, this means that the truth of the premises guarantees the truth of the conclusion. If a deductive argument is valid, then it is impossible for the premises to be true and the conclusion false. Necessarily, if the premises are true, the conclusion is true also.

All men are mortal.

Socrates is a man.

Therefore, Socrates is mortal.

If I drink Fanta I have the strength of 10 men.

I'm drinking Fanta.

Therefore, I have the strength of 10 men.

Invalidity

- If a deductive argument is not valid, then it is **invalid.** A deductive argument is invalid if, assuming the premises are true, the conclusion might not be true. That is, it is possible for the premises to be true and the conclusion false.

Everyone who drinks beer is an adult.

Luke is an adult.

Therefore, Luke drinks beer.

Invalidity and truth

- It does not matter for invalidity whether or not the premises actually are true, just that it is possible that *if they were true*, the conclusion could be false. Invalid arguments can have true premises and true conclusions.

Cats are mammals

Cats are carnivores

Lots of people own cats as pets

True premises, true conclusion, but an invalid argument

Invalid argument

- Australia is in the Southern hemisphere.
- Australia is a continent.
- Australia has very few earthquakes.

- The conclusion doesn't follow from the premises.
- Those premises could be true in circumstances in which the conclusion was false.

Conditional arguments

- **Conditional arguments** are a kind of deductive argument. They contain as premises a conditional statement and the affirmation or denial of one of its conditions. So, their premises include a **conditional premise** and a **non-conditional premise**.

Conditional Premise: If my pet is a cat then my pet is mammal.

Non-Conditional Premise: My pet is a cat.

Therefore, my pet is a mammal.

This argument has the form:

If p then q.

p_____

Therefore q

Forms of conditional arguments

- Conditional arguments come in four standard forms:
- **affirming the sufficient condition**
- **denying the sufficient condition**
- **affirming the necessary condition**
- **denying the necessary condition**.

- To affirm a condition is to say that it is true. To deny a condition is to say that it is false. E.g. “It is not the case that p” is a denial of p.

Naming Conditional Arguments

- The names that we give to these four forms of conditional argument refer to what happens in the non-conditional premise, not to what happens in the conclusion.

- An argument "affirms the sufficient" if *one of the premises* affirms the sufficient condition (NOT if the conclusion affirms the sufficient condition). The conclusion of a conditional argument is the affirmation or denial of the remaining condition.

Affirming the sufficient condition.

- The valid conditional argument form where the non-conditional premise affirms the sufficient condition of the conditional statement.
- This argument has the Latin name "**Modus Ponens**". It is also called "affirming the antecedent".

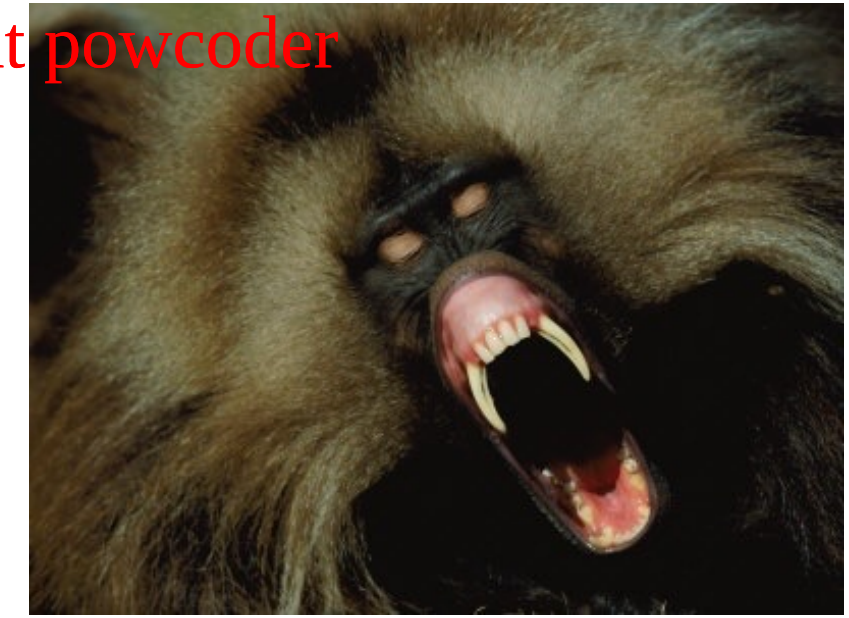
If p then q.

p

Therefore q

Examples of Affirming the Sufficient

- **If there is a baboon in your tent, you ought not go into your tent.**
- **There is a baboon in your tent.**
- **Therefore, you ought not go into your tent.**



Valid, but not sound

- **If I play Roger Federer in tennis tomorrow, I will beat him.**
- **I am playing Roger Federer in tennis tomorrow.**
- **Therefore, I will beat him.**

- If those premises were true, then it would have to be the case that the conclusion is also true. This implies that the argument is valid. But both premises are false, so the argument is not sound.

Denying the necessary condition

- The valid conditional argument form where the non-conditional premise denies (i.e. is the negation of) the necessary condition of the conditional statement.
- (This argument has the Latin name "Modus Tollens". It is also called "denying the consequent".)

If p then q.

Not q

Therefore not p

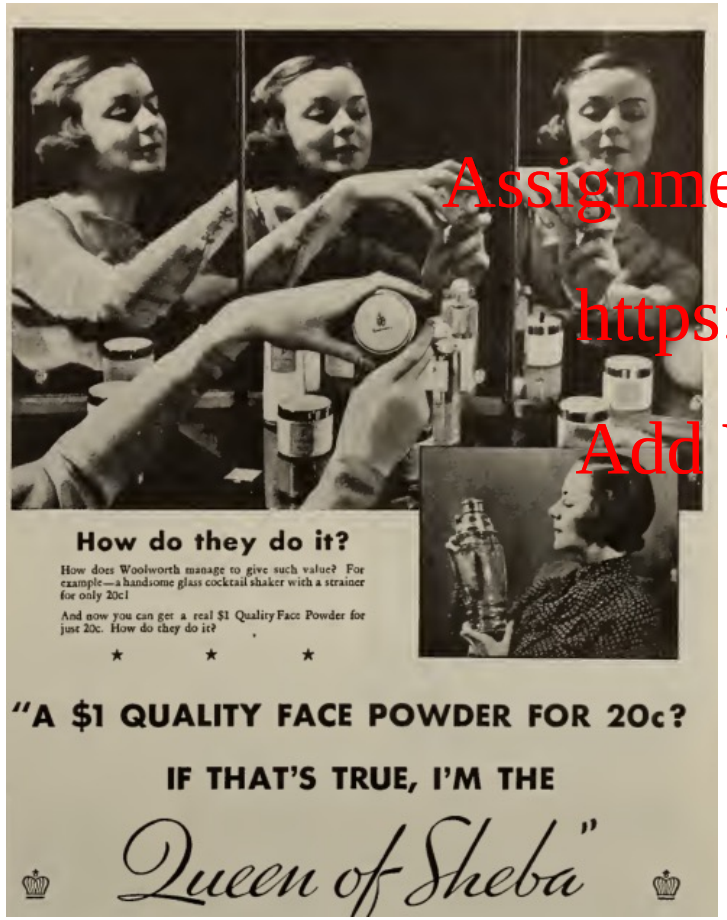
Examples of Den Nec

- If you are from New York then you are from the USA.
- You are not from the USA.
- Therefore, you are not from New York.

- If Debbie is older than you then Debbie is older than your little sister.
- Debbie is not older than your little sister
- Therefore Debbie is not older than you.

- These arguments are valid

If … then I'm the Queen of Sheba



- If you are the best painter in Australia, then I am the Queen of Sheba.
- I am not the Queen of Sheba.
- Therefore, you are not the best painter in Australia.

Denying the necessary. Valid.

Flip it around but preserve the meaning

- The argument form “Denying the necessary” gives us a neat way to change the order of conditions in a conditional claim while preserving its meaning.
- 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 start with the conditional “If p then q” and then deny the necessary. We get: “If not q then not p”.

- “If p then q” has the same meaning as “If not q then not p”.

Mnemonics

- 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.

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