

# Logical Argument Mapping (LAM) – A Manual

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Logical Argument Mapping (LAM) is based on two ideas: (a) that visualizing what we think about an issues helps us to reflect on our own thinking—and on that of others when we are using LAM to analyze given arguments—and (b) that imposing the standard of logical validity on the construction of argument maps both helps us to evaluate the soundness and strength of arguments and challenges us to criticize and improve our own thinking as long as it takes to create the best possible argument.

## 1. Three basic rules

1. Structure your map according to an argument form (or scheme) whose logical validity is evident and generally accepted (e.g., *modus ponens*, *modus tollens*, alternative syllogism, disjunctive syllogism, conditional syllogism, etc., but also argument schemes that are transformed from invalid forms into valid ones like complete induction, argument from perfect authority, and argument from perfect analogy; see section 4 for a list)
2. Make sure that all your premises (reasons and warrants) are true, and provide further arguments for their truth if it is not evident
3. Make sure that all your premises are consistent with each other.

## 2. The procedure of Logical Argument Mapping in seven steps

1. Formulate a claim: the central goal of your argument, a central thesis
2. Provide a reason for your claim
3. Select from a list of argument schemes whose formal validity you accept (see section 4 for a list) the scheme that is most adequate for your argument
4. Transform your argument into a logical argument by adding what is missing, and by reformulating the elements of the argument (claim, reason, warrant) in such a way that its validity in accordance with the scheme becomes evident
5. Consider possible objections against both the reason and the warrant, formulate them, and link them to the elements of your map against which they are directed (see section 5 for some “conflict schemes” you can use for this purpose).
6. Decide whether to
  - a) develop new arguments against the objections, or
  - b) reformulate the original argument in such a way that it can be defended against the objection by, e.g.,
    - including exceptions into the warrant and limiting the scope of the claim (go back to step 1. or 2.), or
    - using a different argument scheme (go to step 3.), or

- redefining the meaning of concepts used in the argument (go to step 1. or 2.)
  - c) give up the whole argument
7. In case of 6.c, start again with step 1. or 2.; in the other cases, do as described in 6.a and b.

### 3. The conventions for constructing LAM maps

#### 3.1. Layout

- The structure of a LAM map is determined by Western reading habits that direct our attention from the top left corner of a page to the right and downwards
- Since the understanding of an argument is facilitated when we know the central claim from the very beginning, this claim is always located on top of the map in the left corner
- Starting from there, we work to the right and downwards to reconstruct the reasons and warrants in an ongoing process of argumentation

#### 3.2. Ontology. The ontology of LAM maps contains statements and relations

- Statements are presented in two different text box forms: rounded rectangles and ovals. Based on their importance for cognitive change, the warrants (see the legend of the first map below for a definition) are highlighted by using oval text boxes; everything else is presented in rounded rectangles
- The ground color specifies a coherent position, all statements in this color must be consistent according to rule 3 (in section 1.); objections and other considerations are presented in different colors
- Relations are represented by arrows. Each arrow must be specified by
  1. its function: “therefore” for arguments; “opposes,” “refutes,” “rejects,” “questions,” “supports,” etc. for other functions
  2. naming the chosen logical argument scheme (S-R: rule of inference scheme, listed in section 4.) or a conflict scheme (S-C; examples are listed in section 5 below). This is important as a reminder that argument schemes can always be replaced by alternative schemes
  3. naming the person/group/institution that claims this relation (AU=author). This allows us to develop conflicting argumentations on one map, or to represent arguments that are cited from other people

### 4. Logical argument schemes

An *argument* is defined as a set of statements—a claim and one or more reasons—where the reasons jointly provide support (not necessarily conclusive) for the claim, or are at least *intended* to support the claim. An “argumentation” is defined here as a set of arguments in which a main argument is supported by further arguments. Since it may be necessary to provide arguments for each of the reasons of the main argument, and further arguments for the reasons of supporting arguments, and so on, the best way to represent an argumentation is an argument map.

A *logical argument* is a valid (or “logically valid,” “deductively valid”) argument. An argument is “valid” if and only if it follows an argument scheme that is valid. An argument scheme is valid if and only if it is impossible for any argument following this scheme to have true premises and a false conclusion. Based on this definition, all the logical argument schemes in this manual (pp. 6-10) are valid. (Note with regard to the examples that “validity” is not “truth”; for validity the truth of the premises is simply *presupposed*, even though you might doubt their truth in these concrete cases. All maps are created with Cmap, <http://cmap.ihmc.us/>).

Although all the argument schemes that are listed on pp. 6-10 are logically valid, there are differences that are important from a pragmatic point of view. On the one hand, you have to decide based on the context which scheme fits best to your purpose. On the other hand, you have to know that the last three of the list—“complete induction,” “perfect authority,” and “perfect analogy”—are *always* hard to defend in real life situations. Thus, use the other ones, if possible. More on that below.

## 5. Defining the meaning of terms like “if-then,” “implies,” “only if,” and “or” by means of truth tables

The validity of *modus ponens* and *modus tollens* in the map on p. 6 is guaranteed by the definition of “if p, then q,” “p implies q,” and “p only if q.” In logic, all these everyday formulations are symbolically represented as “ $p \supset q$ ” (you will find also “ $p \rightarrow q$ ”), and the meaning of this symbol again is defined by the following truth table (a “truth table” defines the meaning of a logical connective by assigning a truth value—true or false—to the connected term for each of all possible combinations of the propositions involved, i.e. “p” and “q” in our case. The first two columns in the truth table below list all possible combinations of truth values for the involved propositions “p” and “q,” and the third column assigns the truth values for the whole term  $p \supset q$ ):

<i>p</i>	<i>q</i>	$p \supset q$
T	T	T
T	F	F
F	T	T
F	F	T

This truth table shows, that the term  $p \supset q$  is *only* false, if p is true and q false (see the 2<sup>nd</sup> row). In all the other possible cases, the term is true. Based on this definition of  $p \supset q$ , we can formulate the proof for the validity of *modus ponens* as follows. Since there are only four possible combinations of p and q (see the first and second column in the table below), we can put the two premises of the *modus ponens* in columns three and four, and its conclusion in column 5:

$p$	$q$	$p \supset q$	$p$	$q$
T	T	T	T	T
T	F	F	T	F
F	T	T	F	T
F	F	T	F	F

Since we defined the validity of an argument by the fact that the conclusion is necessarily true if the premises are true, we only have to check those rows in our truth table in which all the premises are true. In the truth table for *modus ponens*, this is the case only in the first row. Since in this row also the conclusion is true (last column; the truth values here are simply the truth values as defined in the 2<sup>nd</sup> column), the argument scheme is valid.

By contrast, the so-called “affirming the consequent” (if  $p$ , then  $q$ ;  $q$ ; therefore  $p$ ) is an *invalid* argument scheme, which again can be demonstrated by means of a truth table:

$p$	$q$	$p \supset q$	$q$	$p$
T	T	T	T	T
T	F	F	F	T
F	T	T	T	F
F	F	T	F	F

In this case, we get true premises in the 1<sup>st</sup> and 3<sup>rd</sup> row, but in the 3<sup>rd</sup> row the conclusion is false. Therefore, this is an invalid argument scheme. In a similar way, the validity of *modus tollens* can be proved.

With regard to the following continuation of our list of valid argument schemes, we need to understand that the confusing variety of forms that we encounter when using the English “or” (or “either ... or”) is based on the fact that the English term is ambivalent. “Or” can not only be used when we talk about an alternative in a way that one alternative is true and the other false, but also when both alternatives are true as in the following case: “Either Lincoln was the 16<sup>th</sup> president or Johnson was the 17<sup>th</sup> president.” In logic, this is called an “inclusive or.” An “exclusive or,” by contrast, (“XOR” for short) is used in the sense “either ... or, but not both.” This distinction is important for the three valid argument schemes listed below. If you have an alternative with regard to which you know that one possibility is true, you must use what I call the “XOR syllogism” when you argue for the falsehood of the other possibility; but if you have an alternative with regard to which you know that one possibility is false, you have to use the “disjunctive syllogism” to argue for the truth of the other one. If you take the wrong scheme, you cannot be sure whether what you are arguing for is necessarily the case. Thus, it is important to know that the disjunctive syllogism is based on an “inclusive or,” and the XOR syllogism on an “exclusive or.” All three forms used in the map below are defined as follows:

$p$	$q$	$p \vee q$ (incl. or)	$p \text{ XOR } q$ (excl. or)	not both $p$ and $q$
T	T	T	F	F
T	F	T	T	T
F	T	T	T	T
F	F	F	F	T

## 5. Conflict schemes

Conflict Schemes can be used to formulate objections. See for a list p. 11.

## 6. An example

The LAM map on p. 12 is based on the following quote from an interview with Abu Bakr Ba'asyir (ABB in the map). Everything that is not explicitly marked as a quote is based on my own interpretation. "AU" means "author of the argument," "S-R" "rules of inference scheme," "S-C" "conflict scheme."

QUESTION: Is it acceptable to postpone a martyrdom action in order to make the hajj (pilgrimage to Mecca)?

ANSWER: A martyrdom action cannot be postponed in this case because jihad is more important than making the hajj. For example one of most revered ulema, Ibn Taymiyah, was asked by a rich person: "Hey Sheikh, I have so much money but I'm confused about donating my money because there are two needy causes. There are poor people who, if I don't help, will die of starvation. But if I use the money for this purpose, then the Jihad will lack funding. Therefore, I need your fatwa (religious decision) O Sheikh." Ibn Taymiyah replied: "Give all your money for jihad. If the poor people die, it is because Allah fated it, because if we lose the Jihad, many more people will die." There is no better deed than Jihad. None. The highest deed in Islam is Jihad. If we commit to Jihad, we can neglect other deeds. America wants to wipe out the teaching of Jihad through Ahmadiyah (an Islamic school of thought that believes that Pakistan's Mirza Ghulam Ahmad is the Prophet Muhammed's successor). Through this organization, America works. Why? Because Ahmadiyah prohibits its followers to undertake Jihad because (they argue) Jihad is the teaching of Christians. This organization originates from India. Its headquarters are in London, funded by America. Ahmadiyah is America's tool to destroy Islam, including JIL (Jaringan Islam Liberal = Islamic Liberal Network), an NGO in Jakarta that advocates a liberal form of Islam. It is funded by USAID.

From: Scott Atran, "Interview with Abu Bakr Ba'asyir. Full Interview in English and Bahasa Indonesia with the Alleged Leader of Jemaah Islamiyah, from Cipinang Prison, Jakarta, August 13 and 15, 2005," [http://www.sitemaker.umich.edu/satran/files/atranba\\_asyirinterview020905.pdf](http://www.sitemaker.umich.edu/satran/files/atranba_asyirinterview020905.pdf), accessed Jan 22, 2006 (2005), pp. 12-13.

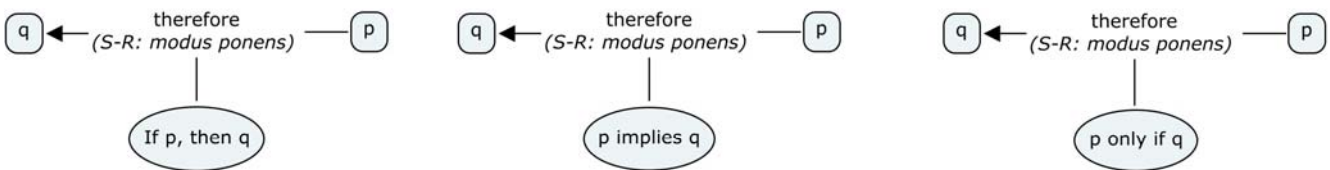
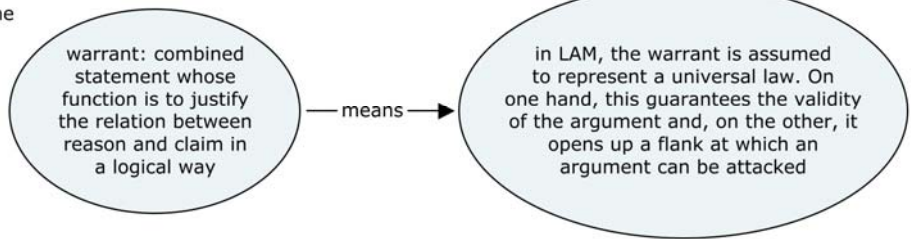
Logical argument schemes

Legend

S-R: rule of inference scheme

form of textboxes

statement

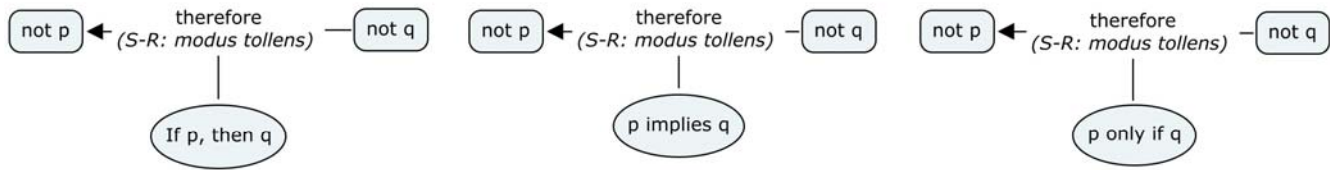
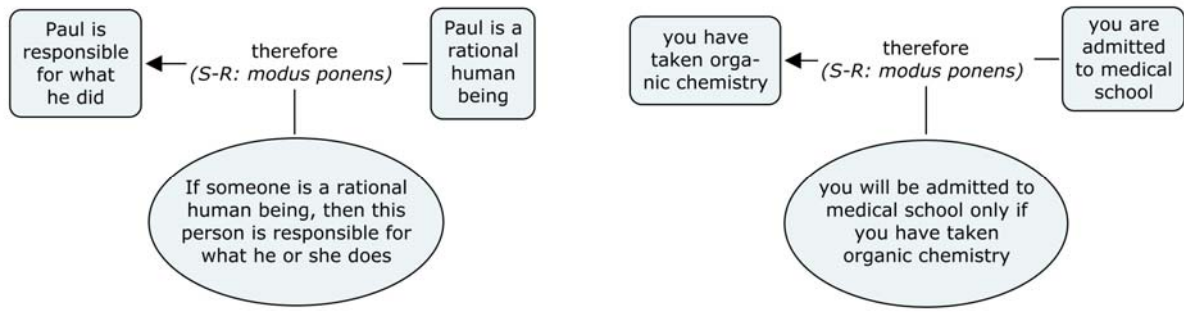


modus ponens can also be used for

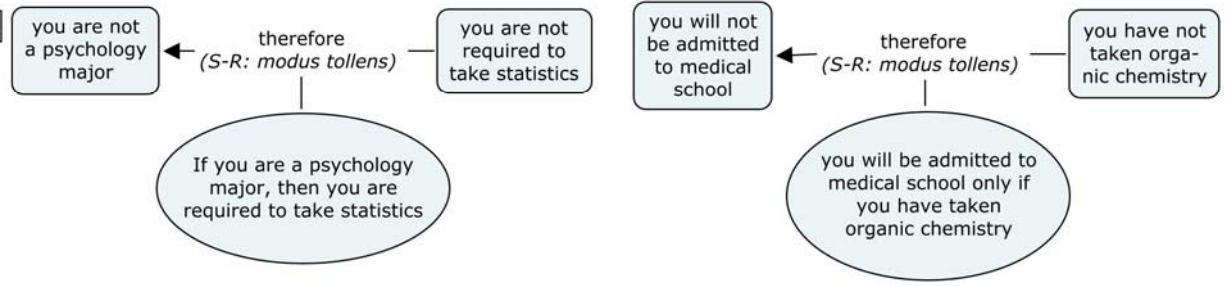
- causal arguments
- pragmatic arguments (in which something is evaluated on the basis of the merits that are attributed to the consequences)

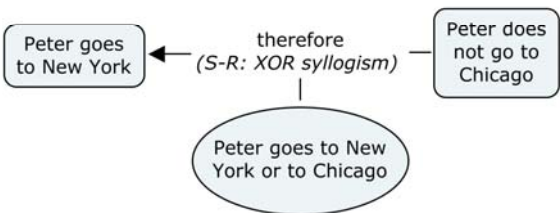
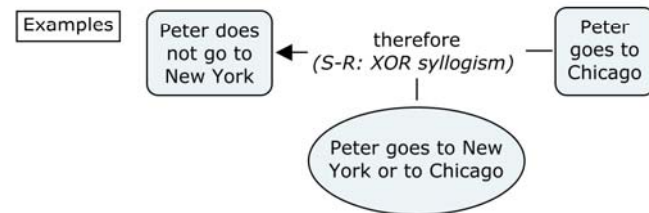
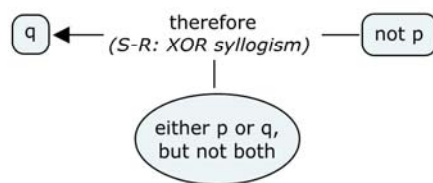
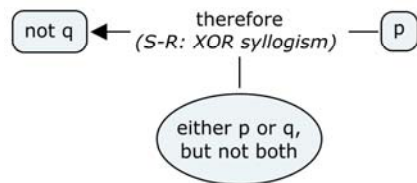
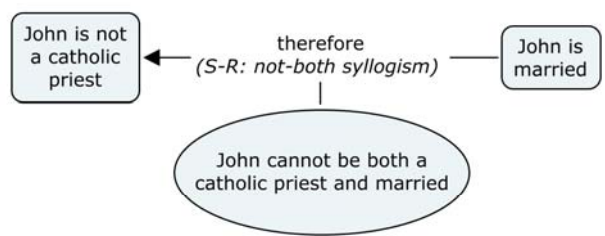
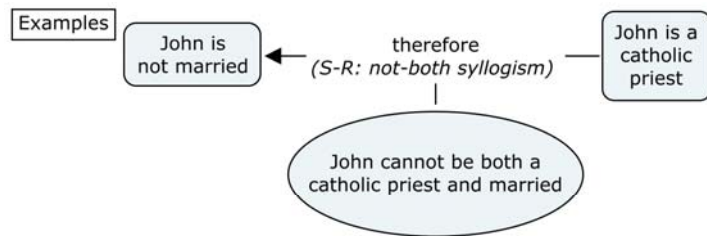
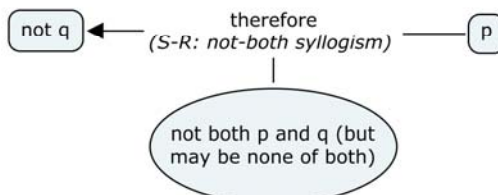
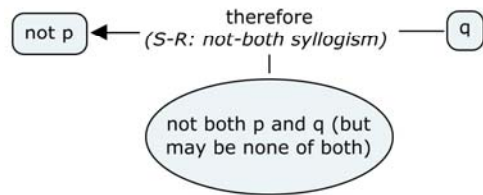
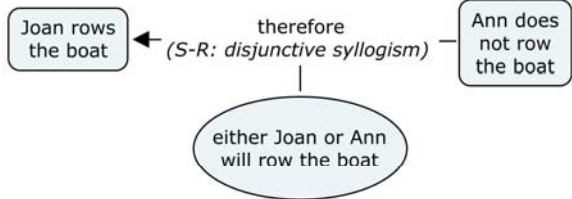
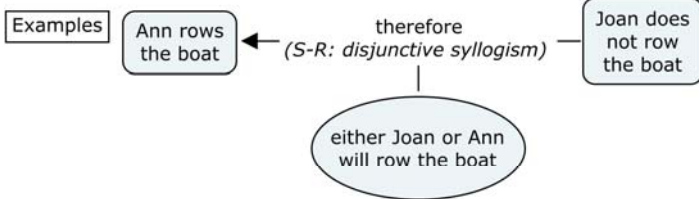
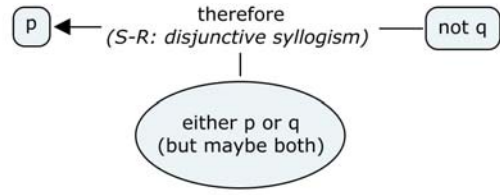
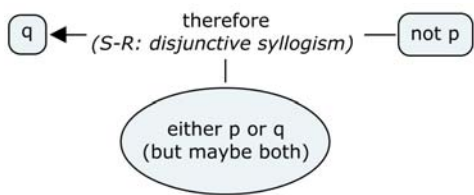
q is a necessary condition for p while p is a sufficient condition for q

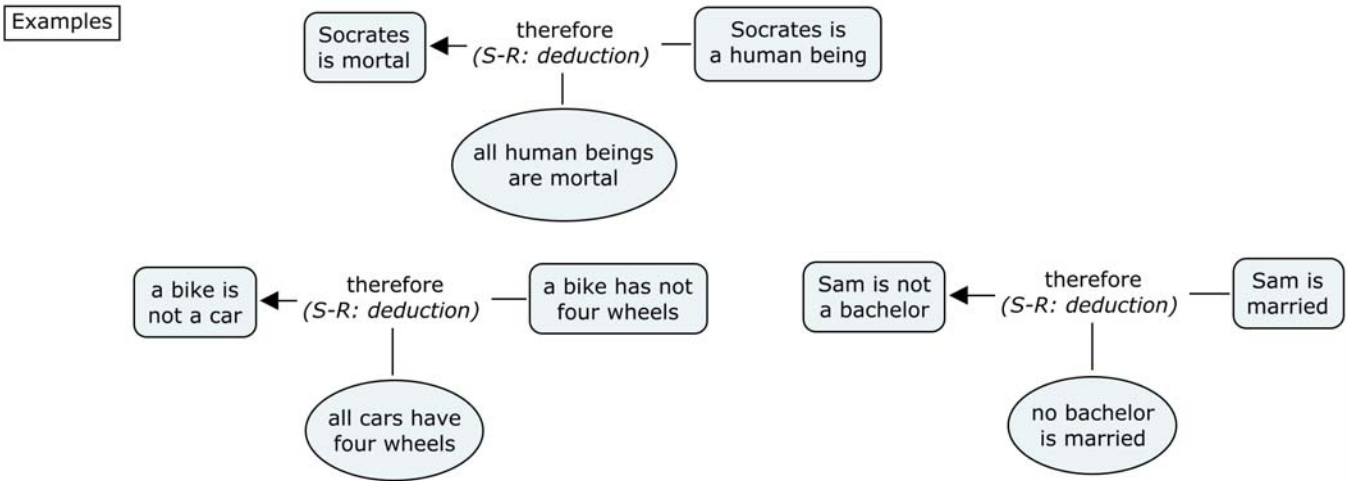
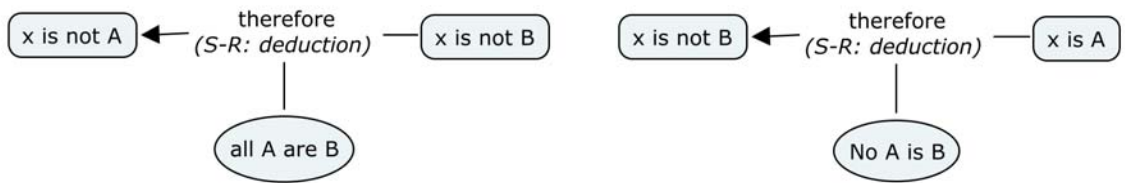
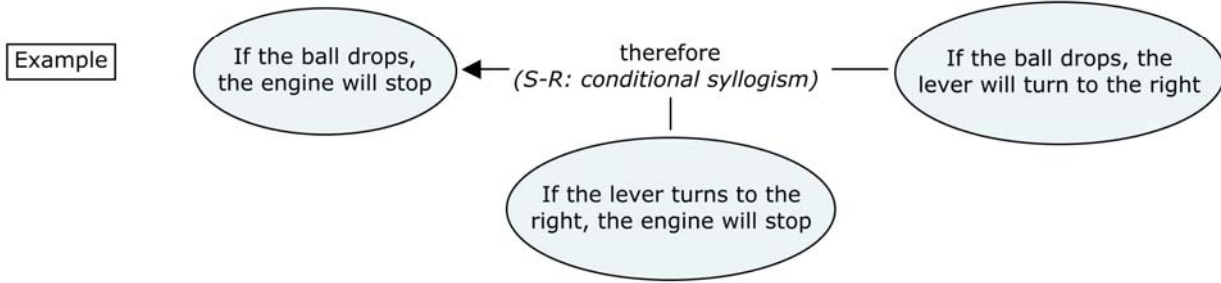
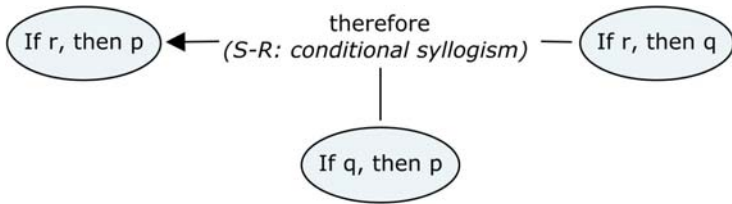
Examples



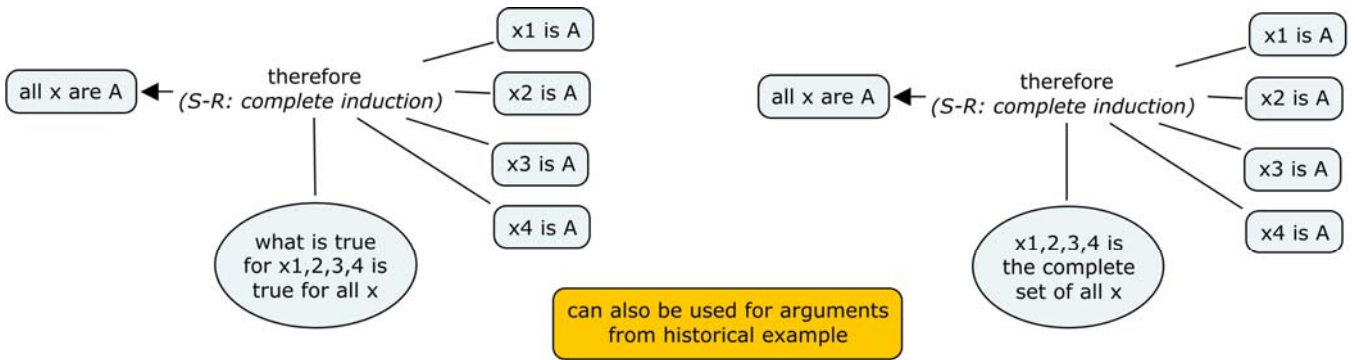
Examples



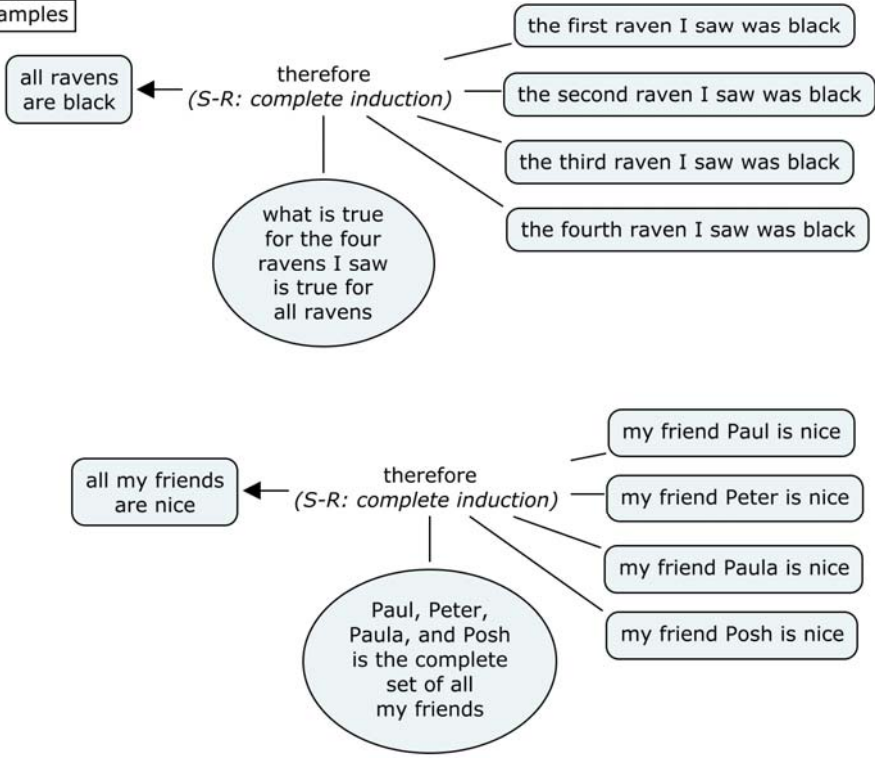




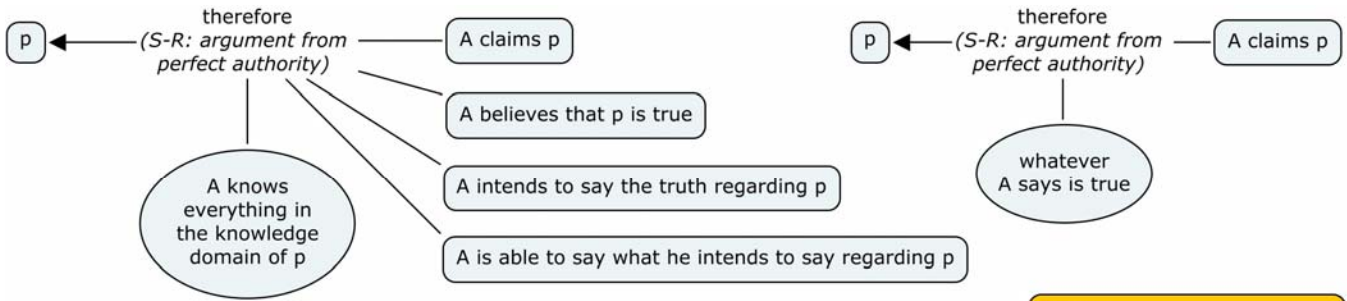




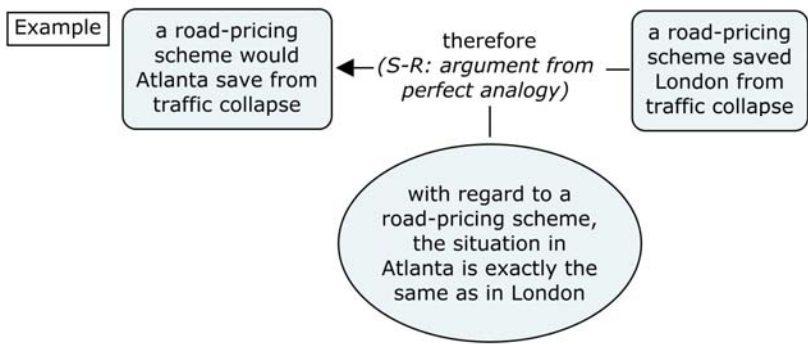
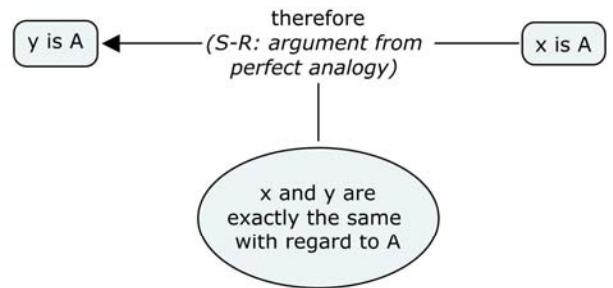
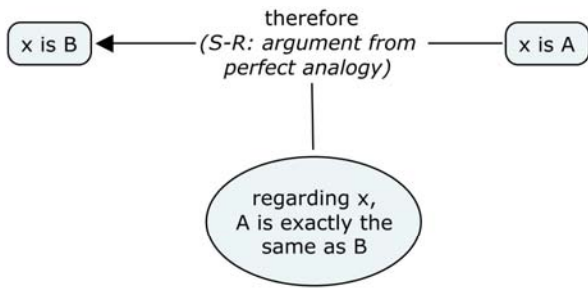
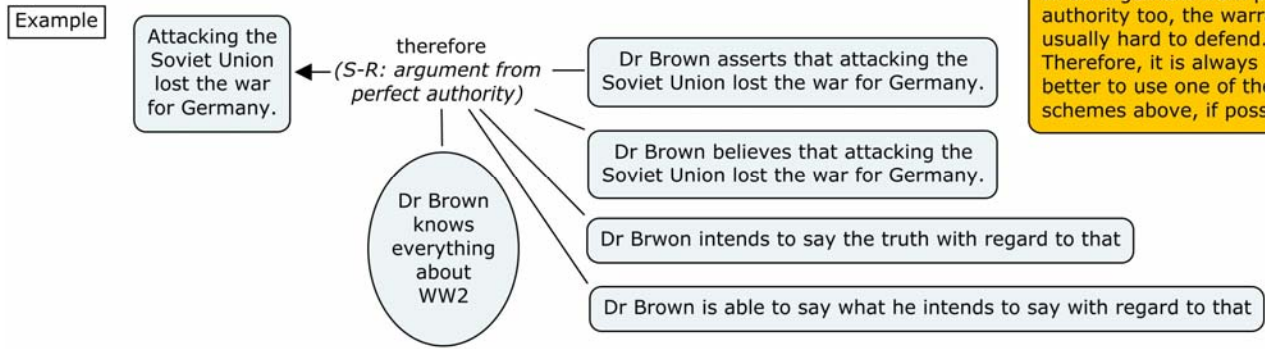
Examples



**NOTE:**  
The warrant in complete induction is usually hard to defend. Therefore, it is always better to use one of the schemes above, if possible. However, since induction may be the argument form we use most often, it is important to map its logical version--that is complete induction--in order to get something on the table that can then be criticized. Based on such a criticism, the whole argument should then be transformed into some weaker and non-logical form by introducing something like "probably," or "in most cases." Thus, the final warrant in this example should say: "what is true for the four ravens I saw is probably true for all ravens"; and the conclusion: "probably all ravens are black."



**NOTE:**  
 In an argument from perfect authority too, the warrant is usually hard to defend. Therefore, it is always better to use one of the other schemes above, if possible.



**NOTE:**  
 The same applies again to an argument from perfect analogy: use an other scheme, if possible.

Conflict schemes (S-C)

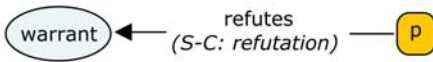
Legend

color of textboxes

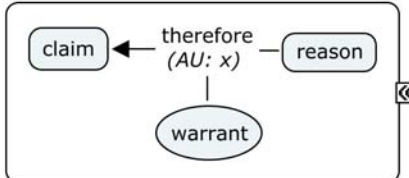
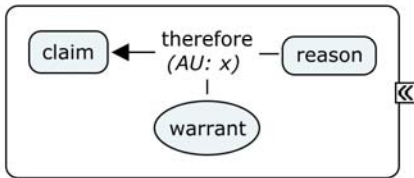
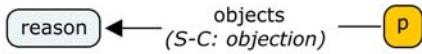
a coherent argumentation (reconstructed)

a statement, or argument, that conflicts with a reason or a warrant

"AU" means "author" (important for quoting objections, and for work in groups)



NOTE:  
since the warrant is supposed to represent a universal law, it can be refuted by one counter example



NOTE:  
ad hominem ("against the man/woman") arguments are always fallacies, because they are only directed against the author of an argument, independently of what the argument itself says. Sometimes, however, for example when we expect that the author of an argument has specific interests in a case, it might be appropriate to illuminate the context of an argument by means of an ad hominem argument.

questions  
(S-C: ad hominem  
AU=y)

x is always wrong

questions  
(S-C: ad hominem  
AU=y)

x is not trustworthy,  
has specific interests, etc.

