

## USING LOGIC

As we have noted, Aristotle advocated that persuasion comes from the use of different kinds of support, including natural and artificial forms of support. We have discussed artificial support. However, we can explore the idea of logic to a much higher extent.

Unlike the other appeals, Logic is especially important for two reasons:

- 1) Logic may be used to organize the entire argument, or
- 2) Logic may be used to support a larger argument structure (where it functions as an artificial form of support).

As a writer, you may use logic to align your sentences, your paragraphs, and even your claim with all of the natural/artificial forms of support in your paper in order to improve coherence.

Here are a few examples.

EX: (Logic in a paragraph)

Violence is a matter of culture rather than a matter of media. In Canada, more people own guns, yet there is less violence. Moreover, Canadians watch the same sorts of television shows (and the same sorts of programming) as citizens of the United States do. Since the amount of watching television and the kinds of programming do not seem to equate to violence, then the culture of the United States must simply be violent.

Notice how there are a few statements made in this example:

Claim:

Violence is a matter of culture rather than a matter of media.

Supporting Statements:

- +Canadians own more guns and are less violent.
- +Americans own less guns and are more violent.
- +Both groups watch the same amount of television and the same programming.
- +Therefore, Americans are prone to violence regardless of the media.

Notice how these statements help to set up the rationale for the cause for violence in the United States (culture rather than media). This rhetorical movement might not be possible without logic.

Learning some brief notions about logic may help to illustrate how such relationships work and how to apply them to your writing.

## ELEMENTS OF FORMAL REASONING

Logic has a few characteristics which is uses to distinguish reasoning from other sorts of appeals, such as Pathos (emotions) and Ethos (ethical character).

1) *Formal reasoning is mostly concerned with statements/declarative sentences.*

You see, in English, there are 4 types of sentences

Exclamations: Sudden Expressions

Interrogative: Questions

Imperative: Commands

Declarative: Statements

Those who use formal reasoning usually work with declarative statements, since these types of sentences are used to show facts, conclusions, and other rational expressions.

Statements (Sentences or utterances that are either true or false)

EX: (Statements)

Dwight is wearing brown shoes.

$4+5=9$

The Milky Way galaxy contains stars.

EX: (Non-statements)

What time is it?

Close the door.

Let's go to the tavern!

2) *In formal reasoning, these statements are divided into two kinds:*

PREMISES (or Propositions) -and- CONCLUSIONS

3) *All statements contain a "truth value."*

"Truth value" means that the statement can be either true or false.

4) *Note that one sentence may contain many statements*

EX:

If Tom is married to Lisa, and Lisa's sister is Jane, then Jack is Jane's brother-in-law.

This is composed of 3 statements.

1. Tom is married

2. Lisa sister is Jane

3. Jack is Jane's brother-in-law.

When examining a person's reasoning, you must seek to simplify all terms (reminiscent of mathematics). That is, you must try to simplify until you have one idea to one sentence (or one statement to one sentence).

5) *Recognize that there are several relationships between statements.*

**CONSISTENCY:** Two statements are consistent if it is possible for both to be true at the same time.

Mary is pregnant. Mary is happy (consistent)  
Mary is pregnant. Mary is a man (inconsistent)

**IMPLICATION:** One statement implies another statement if it is impossible for the former to be true and the latter false.

Mary is pregnant. Mary is a female.  
Mary is pregnant implies that Mary is female.

Notice what happens when we invert the statement.

Mary is a female. Mary is pregnant.  
Mary is female does not imply that Mary is pregnant... Interesting yet?

**EQUIVALENCE:** Two statements are logically equivalent if they necessarily have the same truth value. In other words, if one is true, the other must be true. And, conversely, if one is false, the other must be false.

Some cars are Toyota vehicles.  
Some Toyota vehicles are cars.

-conversely-

All snakes are reptiles.  
All reptiles are snakes.

### EVALUATING FORMAL REASONING

In order to begin evaluating reasoning, you must first find the premises and the conclusions.

1. Ask what single statement is claimed to follow from the others? Oftentimes, the answer points to a conclusion.

EX:

John ate the meat for dinner and then became sick. The meat must have been bad.

Hint: When two statements are joined by "and" or "but" they are probably both premises (on either side of the conjunction).

2. New information which is formed by the premises usually leads to a conclusion.

Look for the old information to find premises and new information to find conclusions.

What do we know? John ate the meat for dinner and became sick. (old)

What can we conclude? The meat must have been bad. (new)

EX:

That wasn't Debbie you met last night. Debbie has blonde hair.

What do we know? Debbie has blonde hair. (old)

What can we conclude? That wasn't Debbie you met last night. (new)

3. Another way to find the premise and the conclusion is to look for indicators.

Premise indicators: Because, since, given that, for, in as much, as, owing to the fact that, due to the fact that, for this reason, as indicated by

Conclusion indicators: therefore, so, thus, consequently, accordingly, it follows that, implies that, hence, so hence, it follows that, as a result (often conjunctive adverbs)

### INDUCTIVE REASONING

Inductive reasoning is a form of reasoning where the conclusion probably follows (but does not necessarily follow) the premises. Much of inductive reasoning is based on the prediction of outcomes.

### EVALUATING INDUCTIVE REASONING

When evaluating formal inductive reasoning, you should be aware of two different notions:

1) Whether the reasoning is Strong or Weak...

2) Whether the reasoning is Cogent (that is, the reasoning contains convincing validity)...

Whether the reasoning is  
STRONG/MODERATE/WEAK

depends on the level of probability that conclusion follows from the premise(s).

Whether the reasoning is  
COGENT

depends on if the truth of the premises is reasonably well-established or highly likely.

EX:

All previous managers have been men. Therefore, the next manager will probably be a man  
(strong + true premises = cogent)

All previous managers were micro-managers. Therefore, the next manager will probably be a  
micro-manager. (strong + false premises = uncogent)

Some of our past managers were micro-managers. Therefore, the next manager will probably  
be a micro-manager. (Weak + false premises = uncogent)

### EVALUATING DEDUCTIVE REASONING (SYLLOGISMS)

Syllogisms are formal forms of reasoning which contain two premises and a single conclusion  
which follows the premises.

You may be familiar with the example.

EX:

Socrates is a man.

All men are mortals.

Therefore, Socrates is mortal.

Here is the Basic Structure of the Syllogism:

- 1) Socrates is a man. (Premise)
- 2) All men are mortal. (Premise)
- 3) Therefore, Socrates is mortal (Conclusion)

TERMS are words or expressions that serve as the subject of the statement or the predicate of  
the statement – proper names ("Socrates") and common names ("Mortals").

Note that terms are typically nouns or noun phrases

QUANTIFIERS/QUALIFIERS are words or expressions which indicate how much of the subject  
class is included in or excluded from the predicate class (e.g., all, no, some, etc.)

COPULAS are words which link the subject term with the predicate term  
(e.g., are, are not, is)

Analysis of the First Premise:

Quantifier: N/A

Subject term: Socrates

Copula: Is

Predicate Term: Man

Analysis of the Second Premise:

Quantifier: All

Subject term: Men  
Copula: Are  
Predicate Term: Mortals

Analysis of the Conclusion:  
Concluding Element: Therefore  
Quantifier: N/A  
Subject term: Socrates  
Copula: Is  
Predicate Term: Mortal

In evaluating syllogisms, one should look at the CONCLUSION to decide if the outcome is valid (that is, true) or invalid (not true).

EX:  
Socrates is a man.  
All men are mortals.  
Therefore, Socrates is mortal. (Valid)

If the first premise is true and the second premise is true, then the conclusion may be valid.

Below are some examples of different forms of syllogisms which are completely context dependent on their validity. You should be familiar with each situation when using logic in your writing.

### VALID CATEGORICAL SYLLOGISM

A valid categorical syllogism is a form of reasoning in which one proposition (the conclusion) is inferred from two others (the premises) of a certain form. In a sense, this syllogism allows for two truthful premises leading to a truthful conclusion.

EX:  
All women are wise.  
Dr. Harrison is a woman.  
So, Dr. Harrison is wise (valid)

If one of the premises is incorrect, then the syllogism is no longer valid.

EX:  
All Harrisons are wise.  
Dr. Harrison is wise.  
So, Dr. Harrison is a woman (invalid).

### CATEGORICAL STATEMENTS

Categorical syllogisms often use these types of particular types of pre-establish patterns for constructing premises. You should be familiar with these:

Universal Affirmative (includes all of something)  
All A are B.

Universal Negative (excludes all of something)  
No A are B.

Particular Affirmative (includes one or a few of something)  
Some A are B.

Particular Negative (excludes one or a few of something)  
Some A are not B.

### DISJUNCTIVE SYLLOGISM (either/or)

In a disjunctive syllogism, the audience is told that at least one of two statements is true; then we are told that it is not the former that is true; so we infer that it has to be the latter that is true.

EX:  
Either Heidi is sick or she is ditching class.  
Heidi is not sick.  
Therefore, Heidi is ditching class.

There are two kinds of logical disjunction: Inclusive and Exclusive

INCLUSIVE means "and/or" where at least one term must be true, or they can both be true.

EXCLUSIVE ("xor") means one must be true and the other must be false. Both terms cannot be true, and both cannot be false.

EX:  
Either A or B.  
Not A.  
Therefore, B.

This syllogism is valid and indifferent between both meanings. However, only in the exclusive meaning is the following form valid:

Either A or B (exclusive).  
A.  
Therefore, not B.

With the inclusive meaning you could draw no conclusion from the first two premises of that argument

### VALID HYPOTHETICAL SYLLOGISM (If/Then)

Hypothetical syllogisms state that if one implies another, and that other implies a third, then the first implies the third. An example hypothetical syllogism:

EX:

If Heidi is absent, then she is sick.

Heidi is absent.

Therefore, Heidi is sick. (valid)

EX:

If Heidi is absent, then she is sick.

Heidi is sick.

Therefore, Heidi is absent. (invalid)

Supposedly, hypothetical syllogisms can even be counterfactual; that is, they can be true even if the premises suppose propositions known to be false.