

Chapter Two

Basic concept of logic

2.1 Introduction

Logic is the study of correct reasoning. Logic pertains to all subjects, since people can reason about anything they can think about. Politics, the arts, literature, business, the sciences, and everyday problems are all subjects open to reasoning. Sometimes the reasoning is good; sometimes, not so good. People use logic to tell the difference. Using logic, we can evaluate bits of reasoning as proper or improper, good or bad. Logic is not the study of how people do reason, but how they should reason. In this sense logic is like arithmetic. Arithmetic describes the rules for addition rather than the psychological process of addition. Just so, logic describes not the psychological process of reasoning but the rules for correct reasoning. Logic does not describe real reasoning, with its errors, omissions, and oversights; it prescribes methods for justifying reasoning; that is, for showing that a given bit of reasoning is proper. Logic thus describes an ideal that actual reasoning strives for but sometimes fails to reach. Logic begins with the study of language. To develop a system of logic, it is necessary to understand how people actually reason. To eliminate the errors that creep into people's performance, we need to examine people's considered judgments about the correctness or incorrectness of inferences. No matter what mental processes people go through to achieve the right result, they try to follow rules for putting sentences together to form proper bits of reasoning. Logicians examine people's evaluations of bits of reasoning to say what the rules of correct reasoning are. Logic describes not the process of reasoning but the rules for correct reasoning.

2.2 Basic Concept of Logic

The word logic it comes from a Greek word which is called '**Logos**'. It means that "**reason, idea or word**". Logic may be defined as the science that evaluates arguments. It is the study of **make reasoning good reasoning**. i.e. reasoning which helps us discover truths.

All of us encounter arguments in our day to day experience. We read them in books and newspaper, hear them on television, and formulate them when communicating with friends and associates. The aim of logic is to develop a system of methods and principles that we may Use as criteria for evaluating the arguments of others and as guides in constructing arguments of our own. Among the benefits to be expected from the study of logic is an increase in confidence that we are making sense when advance arguments of our own.

Argument, premises, and conclusions

1. Argument: A sentence or group of sentences which contains at least one premises and a conclusion. An argument may contain more than one premises but it must contain at least one.

An argument, as it occurs in logic, is a group of statements, one or more of which (the premises) are claimed to provide support for, or reasons to believe, one of the other (the conclusion). All arguments may be placed in one of two basic groups: those in which the premises really do support the conclusion and those in which they do not even though they are claimed to. The former are said to be good arguments (at least to that extent), the latter bad arguments.

Inferring: is the process of arriving at a conclusion on the basis of premises. The term “inference” is ambiguous sometimes it is applied to the conclusion of an argument, and sometimes to the process of inferring a conclusion from premises.

Reasoning: The process of marshalling premises and inferring conclusion.

Proof: An argument which is success full in establishing the fact of its conclusion. It is a general case of an argument. An argument can be valid or invalid.

2. Premises: A sentences which is used or represented as a basis for inferring a conclusion. An often sentence which provide, or is presented as providing, evidence or support for a conclusion. In general, Premises _ claimed evidence.

3. Conclusion: The sentence which is inferred from the premises, or a sentence which is represented as being true if true premises are true. In general, Conclusion _ what is claimed to follow from the evidence.

Sentence: It is a grammatical unit that gives a complete idea. That is with sentences used to express claims that are either true or false. A use of a sentence to assert something that is true or false is called statement.

Unlike statements, many sentences cannot be said to be either true or false such as **question, proposals, commands, suggestions and exclamations.**

E.g.: - Where is Addis Ababa? (Question)

- Fantastic! (Exclamation)
- Turn off the TV right now (command)
- Let's go to a movie to night (Proposal)

One of the most important tasks in the analysis of arguments is being able to distinguish premises from conclusion. If what is thought to be a conclusion is really a premise, and vice versa, the subsequent analysis cannot possibly be correct. Frequently, arguments contain certain indicator words that provide clues in identifying premises and conclusion. Some typical **conclusion indicators** are:

Accordingly	hence	implies that
Entails that	consequently	whence
Wherefore	thus	so
Therefore	it must be that	it follows that
We may conclude	we may infer	as a result

Whenever a statement follows one of these indicators, it can usually be identified as conclusion. By process of elimination the other statements in the argument are the premises.

Example: - A federal government usually possesses a constitution, which guarantees power sharing between the federal government and those regional governments. This implies that distribution of power is the silent feature of any federal government.

If an argument does not contain a conclusion indicator, It may contain a premises indicator. Some typical **premise indicators** are:

Because	as	seeing that
Since	given that	owing that
For	in that	for the reason that
As indicated by	may be inferred from	in as much as

Any statement following one of these indicators can usually be identified as a premise.

Example: Expectant mothers should never use recreational drug, since the use of these drugs can jeopardize the development of the fetus.

The premise of this argument is “the use of these drugs can jeopardize the development of the fetus.” And the conclusion is “Expectant mothers should never use recreational drugs.”

2.3 Techniques of recognizing argument

The first stage in critical thinking is argument identification. Given that some of what people say and do is not argumentative, one must be able to distinguish the arguments from other types of expression. The situation here is no different than in, say, an English Comprehension question where you are asked to find the split infinitives in a chunk of text. It will be difficult to do well on this question unless you know how to properly identify split infinitives. The same is true for arguments, and this section is designed to help you enhance your ability to spot arguments when they are afoot/ established.

There are three steps to argument identification:

1. Understand the Context: Is someone trying to convince you of something?
2. Identify the Conclusion: What are they trying to convince you?
3. Identify the Reasons: Why do they think you should believe them?

I. Understanding the Context

If you wish to become skilled at grappling with arguments, you must become skilled at spotting them, and if you want to become skilled at spotting them, it helps to know where they are typically found. In general, we are pretty aware of the obvious argument contexts--- debates, classrooms, the media, political discussions among friends, etc. We are also sensitive to certain words and phrases that mark arguments, e.g., 'argument', 'my view', 'my opinion', 'what you should think'. The first step in enhancing critical thinking ability, though, requires careful reflection on this awareness. Focuses your attention on specific contexts and asks you to determine whether you take them to be argument contexts.

II. Identifying the Conclusion

Typically, the main purpose of an argument is to press a point. That is, arguments are vehicles intended to convince or compel people to believe something. This "something" is what we have called the conclusion. Whether the argument works or not depends on whether it supplies compelling reason to believe this conclusion, but first things first---you can't assess the effectiveness of an argument without first identifying its conclusion.

As with argument contexts, you can enhance your critical thinking ability by learning of ways to identify the conclusions of arguments. Most of the time, this won't be too difficult; after all, it is in the best interest of the arguer that their conclusion be clear. This can be done in several

ways. One technique is to position the conclusion prominently at the beginning or the end of the argument, **e.g.**, at the beginning or end of the paragraph that contains the argument. Another is to repeat the conclusion during the course of the argument several times; calling attention to the fact that it is the most important point. Finally, there are words and phrases whose primary purpose is to introduce the conclusion---call these "conclusion markers". Conclusion markers include the following: 'therefore', 'thus', 'hence', 'as a result', 'in that case', 'then', 'so', 'accordingly', 'the bottom line', 'as a consequence', and 'for this reason'. **Be careful**, though---not all appearances of these terms mark conclusions; for example, 'then' often indicates the next event in a series of events.

III. Identifying the Reasons

The other essential part of the argument that one must identify are the reasons. These are claims that support the conclusion---as their name suggests, they give you reason to believe it. Without them, there is no argument---just a claim. Thus, it is a mistake to respond to a request for your argument by saying, for **example**, "Bush will win in 2004!" This may be your conclusion, but without reasons, it is no argument.

As with conclusions, there are ways to identify reasons. One fast-and- loose method is to take everything that isn't a conclusion in the argument to be a reason. However, as we will see in the next section, this will give you false positives, that is, claims that are considered reasons without actually being reasons, since arguments often contain claims that serve other purposes (**e.g.**, humor, small talk, rhetorical flourish, etc.). The most effective method is to look for "reason markers". These terms include the following: 'because', 'since', 'for', 'in light of', 'reason', 'assume', 'according to', 'considering', 'by', 'if', 'in fact', etc. As before, you need to take care when evaluating appearances of these terms---not all appearances mark reasons.

VI. Putting It All Together

Read the chapter closely, marking where the dragon's arguments appear in your books or on a piece of paper. When searching for these, look for reason and conclusion markers, but also look for changes in focus by the dragon and changes in argumentative strategy. When you have done this, compare your list of arguments to the list in the key, indicated by conclusion and page number.

V. Summary

It helps to know what snipe are and how to identify them. If you are critically thinking, where we take this to mean analyzing arguments, it helps to know what arguments are and how to

identify them. By developing sensitivity to argument contexts and indications of conclusions and reasons, one can become a very effective argument spotter.

2.4 Types of argument

In the study of logical reasoning, arguments can be separated into two categories: deductive and inductive. Deductive reasoning is sometimes described as a "top-down" form of logic, while inductive reasoning is considered "bottom-up."

2.4.1 Deductive Arguments

A deductive argument is one in which true premises guarantee a true conclusion. In other words, it is impossible for the premises to be true but the conclusion false. Thus, the conclusion follows necessarily from the premises and inferences. In this way, a true premise is supposed to lead to a definitive proof truth for the claim (conclusion). Here is a classic **example**:

1. Socrates was a man (premise)
2. All men are mortal (premise).
3. Socrates was mortal (conclusion)

The essence of the argument, mathematically, is: If $A = B$ and $B = C$, then $A = C$.

As you can see, if the premises are true (and they are), then it simply isn't possible for the conclusion to be false. If you have a correctly formulated deductive argument and you accept the truth of the premises, then you must also accept the truth of the conclusion; if you reject it, then you are rejecting logic itself. There are those that argue, with some irony/satire, that politicians are sometimes guilty of such fallacies —rejecting deductive conclusions against all logic.

2.4.2 Inductive Arguments

An inductive argument, sometimes considered bottom-up logic, is one in which premises offer strong support for a conclusion, but one that is not a certainty. This is an argument in which the premises are supposed to support the conclusion in such a way that if the premises are true, it is improbable that the conclusion would be false. Thus, the conclusion follows probably from the premises and inferences. Here is an example:

1. Socrates was Greek (premise)
2. Most Greeks eat fish (premise)
3. Socrates ate fish (conclusion)

In this example, even if both premises are true, it is still possible for the conclusion to be false (maybe Socrates was allergic to fish, for example). Words which tend to mark an argument as inductive—and hence probabilistic rather than necessary—include words like probably, likely, possibly and reasonably.

2.5 Evaluation of Arguments

How to evaluate an argument?

1. Identify the conclusion and the premises.
2. Put the argument in standard form.
3. Decide if the argument is deductive or non-deductive.
4. Determine whether the argument succeeds logically.
5. If the argument succeeds logically, assess whether the premises are true. For premises that are backed-up by a sub-arguments, repeat all the steps for the sub-arguments.
6. Make a final judgment: is the argument good or bad?

These are general guidelines for identifying and evaluating an author's argument. The goal is to make sure you:

1. are clear about the nature of the argument under examination;
2. Focus your thinking on the most interesting and controversial steps in the argument; and
3. Make some progress toward finding the truth, or at least identifying exactly why you agree or disagree with the author's argument.

STEP 1: Identify the conclusion of the argument. Sometimes that is more difficult than it at first appears. You may find that as you try to identify premises you change your mind about what the conclusion is or how to phrase it. That is fine.

STEP 2: Identify the stated premises mentioned by the author in support of the conclusion. These are the reasons the author gives for believing his or her conclusion.

STEP 3: Identify any unstated premises or assumptions that are necessary in order that the stated premises actually provide support for the conclusion.

STEP 4: Evaluate whether the premises provide reasonable support for the conclusion.

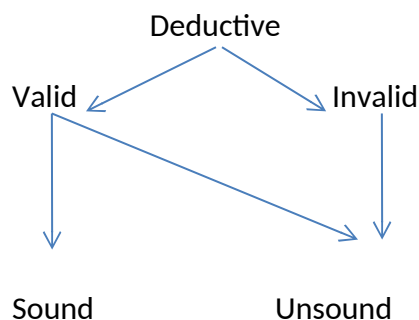
Inductive Arguments: If the premises are supposed to provide evidence or support but not conclusive proof of the conclusion, evaluate whether the premises, if true, would actually provide support for the conclusion and how strong you think the support would be (e.g. in light of contrary evidence). Deductive Arguments: If the premises are supposed to provide conclusive proof of the conclusion, evaluate whether the argument is valid or invalid. Valid: it is impossible for the conclusion to be false if all the premises were true Invalid: this is not impossible

STEP 5: Evaluate whether the premises are true or false. Is there reason to question one of the premises? What could the author say in defense of the premise?

RECURSION STEP (Optional): If one premise is especially important to evaluating the argument, go back to Step 1 and take that premise as a conclusion, looking for a further argument in support of it, and then evaluating that further argument. This then could lead to another recursion to evaluate another premise, and so on until all questions are resolved and the truth has become transparent to all!

2.5.1 Evaluating deductive arguments

Revealing the logical form of a deductive argument helps with logical analysis and evaluation. When we evaluate deductive arguments, we use the following concepts: valid, invalid, sound, and unsound. A **valid argument** is one where, assuming the premises are true, it is impossible for the conclusion to be false. In other words, the conclusion follows necessarily from the premises. An **invalid argument** is one where, assuming the premises are true, it is possible for the conclusion to be false. In other words, a deductive argument in which the conclusion does not follow necessarily from the premises is an invalid argument. When logical analysis shows that a deductive argument is valid, and when truth value analysis of the premises shows that they are all true, then the argument is **sound**. If a deductive argument is invalid, or if at least one of the premises is false (truth value analysis), then the argument is **unsound**.



Valid argument = an argument in which it impossible for the conclusion to be false given that premises are true.

Invalid argument = it possible for the conclusion to be false given that the premises are true.

Sound argument = Valid argument + All true premises

Unsound argument = Invalid argument + at least one premises is false

Premise	Conclusion	Evaluation	
T	T	Valid or invalid	?
T	F	Invalid	Unsound
F	T	Valid or invalid	Unsound
F	F	Valid or invalid	Unsound

An argument having true premises and true conclusion could be either **valid** or **invalid** depending upon the reasoning process. If the truth of the premise supports to the truth of the conclusion then the argument is **valid**, if not it is **invalid**.

E.g. **True** premise and **true** conclusion but **invalid**

All women are mammals.

All students are mortal.

Hence, all women are mortal.

The above argument is invalid. Because there is no evidence that indicates all women are mortal; the two premises assert about different things; they don't help each other to prove the truth of the conclusion.

E.g. **True** premise and **True** conclusion and **valid**

All women are humans.

All human are mortal. So, all women are mortal.

E.g. **True** premise and **false** conclusion and **invalid**

All women are mammals.

All dogs are mammals.

So, all men are dogs.

It is always invalid, because in a correctly formed deductive argument if the premise is true then it is impossible for the conclusion to be false.

E.g. **False** premise and **True** conclusion but **invalid**

All babies are cattle.

All cattle are humans.

Therefore, all babies are humans.

An argument having **false** premise and **true** conclusion could be either **valid** or **invalid**.

E.g. **False** premise and **False** conclusion but **valid**

All birds are politicians.

All politicians are liars.

Therefore, all birds are liars.

E.g. **False** premise and **false** conclusion but **invalid**

All cows are musicians.

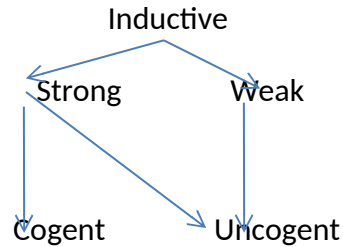
All humans are musicians

Hence, all cows are humans.

All the above cases imply that false evidence can support both true and false conclusion validity and invalidity are determined by reasoning process, not by truth/ falsity with exception of having actually true premise and false conclusion.

2.5.2 Evaluating inductive arguments

When we evaluate inductive arguments, we use the following concepts: strong, weak, cogent, and uncogent. A **strong** inductive argument is one such that if the premises are assumed to be true, then the conclusion is probably true. In other words, if the premises are assumed to be true, then it is improbable that the conclusion is false. A **weak** inductive argument is one such that if the premises are assumed to be true, then the conclusion is not probably true. An inductive argument is **cogent** when the argument is strong and the premises are true. An inductive argument is **uncogent** if either or both of the following conditions hold: the argument is weak, or the argument has at least one false premise.



Strong = Premises are assumed to be true + Conclusion probable is true

Weak = Premises are assumed to be true + Conclusion improbable to be false

Cogent argument = Strong argument + All true premises

Uncogent = Weak + at least one premise false

Premise	Conclusion	Evaluation	
T	Probably True	Strong or weak	?
F	Probably False	Weak	Uncogent
F	Probably True	Strong or weak	Uncogent
F	Probably False	Strong or weak	Uncogent

E.g. –Most human fear death. Teddy Afro is a human.

Therefore, Teddy Afro fears death. (**Strong** and **cogent**)

- 98% of St. George football club fans hate Ethiopia Bunna sport club.
Samson is a St. George fan. Therefore, Samson hate bunna sport club. (**Strong**)
- Challa's horse is similar in its colour and height to Taddle's horse.
Taddle's horse is able to jump a fence. Hence, Challa's horse is able to jump a fence also. (**Weak** and **uncogent**)