A Mini Guide to Critical Thinking

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1. Introduction

Critical thinking is the ability to engage in reflective and independent thinking, and being able to think clearly and rationally.

Critical thinking does not mean being argumentative or being critical of others. Although critical thinking skills can be used in exposing fallacies and bad reasoning, they can also be used to support other viewpoints, and to cooperate with others in solving problems and acquiring knowledge.

Critical thinking is a general thinking skill that is useful for all sorts of careers and professions. Clear and systematic thinking can improve the comprehension and expression of ideas, so good critical thinking can also enhance language and presentation skills.

It is sometimes suggested that critical thinking is incompatible with creativity. This is a misconception, as creativity is not just a matter of coming up with new ideas. A creative person is someone who can generate new ideas that are useful and relevant to the task at hand. Critical thinking plays a crucial role in evaluating the usefulness of new ideas, selecting the best ones and modifying them if necessary.

Critical thinking is also necessary for self-reflection. In order to live a meaningful life and to structure our lives accordingly, we need to justify and reflect on our values and decisions. Critical thinking provides the tools for this process of self-evaluation.

This mini guide contains a brief discussion of the basics of critical thinking. It is neither a comprehensive survey nor a self-contained textbook. The aim is to highlight some of the more important concepts and principles of critical thinking to give a general impression of the field. For further study, readers can look up the books and online resources listed at the end.

2. Meaning

LITERAL MEANING is a property of linguistic expressions. The literal meaning

of a sequence of words is determined by its grammatical properties and the meanings that are conventionally assigned to those words. The literal meaning of a statement should be distinguished from its conversational implicature - the information that is implicitly conveyed in a particular conversational context, distinct from the literal meaning of the statement.

For example, suppose we ask Lily whether she wants to go to the cinema and she replies, "I am very tired." Naturally we would infer that Lily does not want to go to the cinema. But this is not part of the literal meaning of what is said. Rather, the information that she does not want to go is inferred indirectly. Similarly, suppose we hear Lala says, "Po likes books". We might perhaps take Lala to be saying that Po likes to read. But this is at most the conversational implicature, and not part of the literal meaning of what is being said. It might turn out that Po hates reading and she likes books only because she regards them as good investment. But even if this is the case, Lala's assertion is still true.

One important point illustrated by this example is that when we want to find out whether a statement is true, it is its literal meaning that we should consider, and not its conversational implicature. This is particularly important in the legal context. The content of a contract is typically given by the literal meaning of the terms of the contract, and if there is a dispute about the contract, ultimately it is settled by looking at the literal meaning of the terms, and not by what one or the other party thinks was implied implicitly.

Meaninglessness

In ordinary language the adjective "meaningless" is sometimes used rather indiscriminately. Claims that are pointless or empty sometimes are also described as "meaningless". For example, suppose Peter is asked whether he will go to the party, and he replies "if I come, I will come." Strictly speaking, this is an empty statement as it does not provide any useful information as to whether Peter might come or not. But the statement is perfectly grammatical and meaningful. To be accurate one should not describe such statements as meaningless.

3.   Definitions

Lack of clarity in meaning can hinder good reasoning and obstruct effective communication. One way to make meaning clearer is to use definitions. A definition is made up of two parts - a DEFINIENDUM and a DEFINIEN. The definiendum is the term that is to be defined, whereas the definien is the group of words or concepts used in the definition that is supposed to have the same meaning as the definiendum. For example, in defining "bachelor" to mean "an unmarried man", the word "bachelor" is the definiendum, and "an unmarried man" is the definien. We might divide definitions into four kinds:

Reportive definition

A REPORTIVE DEFINITION is sometimes also known as a lexical definition. It reports the existing meaning of a term. This includes the "bachelor" example above, or the definition of "prime number" as referring to any integer greater than one and divisible only by one and itself. A reportive definition should capture the correct usage of the term that is defined.

Stipulative definition

A STIPULATIVE DEFINITION is not used to explain the existing meaning of a term. It is used to assign a new meaning to a term, whether or not the term has already got a meaning. If the stipulative definition is accepted, then the term is used in the new way that is prescribed. For example, suppose a stipulative definition is proposed to define "MBA" to mean "married but available". Accepting such a definition, we can then go about describing other people as MBAs.

Precising definition

A PRECISING DEFINITION might be regarded as a combination of reportive and stipulative definition. The aim of a precising definition is to make the meaning of a term more precise for some purpose. For example, a bus company might want to give discounts to elderly people. But simply declaring that the elderly can pay a reduced fare will lead to many disputes,

since it is not clear how old one should be in order to be an elderly person. So one might define "an elderly person" to mean "any person of age 65 or above". This is of course one among many possible definitions.

Similarly, précising definitions are very important in drawing up laws and regulations. We might want to eliminate or punish sexual harassment, but we need a good definition of sexual harassment in order that people know what is appropriate and what is not. For example, a biology professor giving an unwelcome surprise exam on human sexuality should better not be counted as sexual harassment under any such definition.

Finally, précising definitions can also be used to resolve disputes that involve some key concepts whose meanings might not be clear enough. Suppose two people are arguing whether animals such as birds or apes possess language. To resolve this dispute, we need to be more precise as to what is meant by "language". If by "language" we refer to any system of communication, then obviously birds and other animals do make use of languages. On the other hand, "language" might be used in a different sense, requiring a combinatorial syntax and semantics, allowing a user of the language to communicate information about objects or situations remote in time and space from the location of discourse. Used in such a way, the communication systems of most animals would not qualify as language.

Persuasive definition

A PERSUASIVE DEFINITION is any definition that attaches an emotive, positive or derogatory meaning to a term where it has none. For example, someone against abortion might define "abortion" as "the murder of an innocent still-born person". This definition carries a negative connotation, as the term "murder" suggests that abortion is wrongful killing, and it also assumes that the aborted fetus is already a person. Such a definition is surely not appropriate in a rational debate on the moral legitimacy of abortion, even though it might be useful as a rhetorical tool.

Evaluating definitions

The criteria for evaluating definitions depend on the kind of definition we are considering. With reportive definition, it is important that the proposed

definition correctly captures the usage of the term that is defined. In particular, this means that the definition should be neither too wide nor too narrow.

A definition is TOO WIDE (or too broad) if the definien applies to things that the definiendum does not apply to. For example, defining an airplane as a machine that flies is too wide since helicopters are also flying machines but they are not airplanes.

A definition is TOO NARROW if the definien fails to apply to things to which the definiendum applies, e.g. defining a triangle as a plane figure with three equal straight sides.

Notice that a definition may be both too wide and too narrow at the same time. If you define vegetables as the edible leaves of any plant, the definition is too narrow as it fails to include tomatoes and potatoes. On the other hand, it is also too wide as tea leaves are edible but are not vegetables.

The question of whether a definition is too broad or too narrow does not arise with stipulative definitions, since the definition is not meant to capture existing usage. But it is important that the definition should avoid circularity, inconsistency and obscurity.

4.   Necessary and sufficient conditions

The concepts of necessary and sufficient conditions help us understand and explain the different kinds of connections between concepts, and how different states of affairs are related to each other.

To say that X is a NECESSARY CONDITION for Y is to say that it is impossible to have Y without X. In other words, the absence of X guarantees the absence of Y. A necessary condition is sometimes also called "an essential condition". Some examples :

- Having four sides is necessary for being a square.
- Being brave is a necessary condition for being a good soldier.
- Not being an even number is essential for being a prime number.

To show that X is not a necessary condition for Y, we simply find a situation where Y is present but X is not. Examples :

- Being rich is not necessary for being well-respected, since a well-respected social activist might in fact be quite poor.
- Living on the land is not necessary for being a mammal. Whales are mammals, but they live in the sea.

We invoke the notion of a necessary condition very often in our daily life, even though we might be using different terms. For example, when we say things like "life requires oxygen", this is equivalent to saying that the presence of oxygen is a necessary condition for the existence of life.

A certain state of affairs might have more than one necessary condition. For example, to be a good concert pianist, having good finger technique is a necessary condition. But this is not enough. Another necessary condition is being good at interpreting piano pieces.

Next, we turn to sufficient conditions. To say that X is a SUFFICIENT CONDITION for Y is to say that the presence of X guarantees the presence of Y. In other words, it is impossible to have X without Y. If X is present, then Y must also be present. Again, some examples :

- Being a square is sufficient for having four sides.
- Being divisible by 4 is sufficient for being an even number.

To show that X is not sufficient for Y, we come up with cases where X is present but Y is not. Examples :

- Loving someone is not sufficient for being loved. A very mean and wicked person who loves someone might not be loved by anyone.
- Loyalty is not sufficient for honesty because one might have to lie in order to protect the person one is loyal to.

Expressions such as "If X then Y", or "X is enough for Y", can also be understood as saying that X is a sufficient condition for Y. Note that some state of affairs can have more than one sufficient condition. Being blue is sufficient for being colored, but of course being green, being red are also

sufficient for being colored.

Given any two conditions X and Y, there are four ways in which they might be related to each other:

- X is necessary but not sufficient for Y.
- X is sufficient but not necessary for Y.
- X is both necessary and sufficient for Y. (or "jointly necessary and sufficient")
- X is neither necessary nor sufficient for Y.

This classification is very useful when we want to clarify how two concepts are related to each other. Here are some examples :

- Having four sides is necessary but not sufficient for being a square (since a rectangle has four sides but it is not a square).
- Having a son is sufficient but not necessary for being a parent (a parent can have only one daughter).
- Being an unmarried man is both necessary and sufficient for being a bachelor.
- Being a tall person is neither necessary nor sufficient for being a successful person.

Necessary and sufficient conditions are often very useful in explaining the connections between abstract concepts. For example, in explaining the nature of democracy we might say that the rule-of-law is necessary but not sufficient for democracy.

5.   Linguistic pitfalls

Linguistic pitfalls are misuses of language where language is used to obscure, distort or make statements appear to be more informative or profound than they actually are.

Ambiguity

There are different kinds of ambiguity. LEXICAL AMBIGUITY refers to cases where a single term has more than one meaning in the language. For

example, the word "deep" can mean profundity ("What you have said is very deep."), or it can be used to describe physical depth ("This hole is very deep"). Similarly for words like "young" (inexperienced or young of age), "bank" (river bank or financial institution), etc.

REFERENTIAL AMBIGUITY arises when the context does not make it clear what a pronoun or quantifier is referring to. For example, the following statement does not make it clear who is hurt:

- "Ally hit Georgia and then she started bleeding." Who is bleeding? Ally or Georgia, or a third party?

Many people like to make very general statements, such as "politicians are corrupt". Literally, this statement implies that there is no politician who is not corrupted. But of course we can think of many counterexamples to such a claim. So the person who makes the statement might say "I don't really mean each and every politician." But then who exactly are the people referred to?

SYNTACTIC AMBIGUITY means having more than one meaning because there is more than one way to interpret the grammatical structure. This can happen even when it is clear what the meanings of the individual words are. Consider the sentence "we shall be discussing violence on TV." It might mean the discussion will be conducted during a television program, or it might mean violence on TV is the topic to be discussed.

When dealing with ambiguous language we should ensure that the context makes it clear to the audience what the correct interpretation should be. When we encounter ambiguity, we might try to clarify meaning explicitly by listing out all the different possible interpretations. This process of removing ambiguity is known as "disambiguation". Naturally, avoiding ambiguity applies only to situations where we want to communicate precisely and accurately. In literary activities, ambiguity might actually be desirable.

Vagueness

A term is vague if it has an imprecise boundary. As the sun sets the surroundings become dark, but there is no sharp boundary when the

surroundings suddenly switch from being bright to being dark. So "dark" and "bright" are vague terms.

"Tall" is also vague since there are cases where it is hard to say whether a person is tall or not, but this indecision is not due to lack of knowledge about that person's height. You might know exactly how tall that person is, but still you cannot decide whether he is tall or not. This is because the meaning of the term is not precise enough. Many terms in the language are vague, e.g. "mountain", "clever", "cheap".

Notice that we should make a distinction between vagueness and ambiguity. A word can be vague even though it is not ambiguous, and the different meanings of an ambiguous term can be very precise indeed.

When we need to be precise and informative we should avoid vagueness. Many students often like to ask questions such as :

- Is there going to be a lot of homework for this course?
- Is the final exam going to be difficult?

But of course words like "difficult" and "a lot" are vague. It is not clear how these questions should be answered! Vague claims are also frequent in horoscope predictions. Here is one:

- Be prepared for a change of direction this week as something crops up.

Since it is not clear what counts as a change of direction (someone blocking your way on the pavement so you can't walk in a straight line?), one can easily find one event or another as "evidence" that confirms the prediction. The same for this rather pointless prediction:

- This piece of news is going to affect the stock market to a certain extent.

It would be a mistake to say that critical thinking requires that we eliminate all vagueness. Vague terms can be useful in everyday life because often we do not have to be too precise. How precise we should be depends of course on the context.

Incomplete Meaning

A term has an incomplete meaning if the property or relation it expresses depends on some further parameter to be specified by the context, either explicitly or implicitly. This includes terms such as "useful", "important", "similar" and "better". Practically all objects are useful and important only in some respects but not others. For example, is love more important than money? Well, it depends. If you are starving to death, then money is more important. But if you are looking for someone to share your life, then love is perhaps better.

So just saying that something is useful or important is empty unless it is made clear in what way it is so. Here are two sample statements whose meanings are not complete:

- "Will this year's final exam be similar to the one last year?"
- "It is better to be beautiful than to be good. But . . . it is better to be good than to be ugly." - Oscar Wilde (1854 - 1900)

Distortion

Distortion is a matter of using words with inappropriate semantic associations, or to use words in a way that deviates from its standard meaning without clear indications.

The use of inappropriate emotive expressions is one typical example of distortion. Many expressions in the language are not purely descriptive but carry positive or negative connotations. Consider again the association of abortion with murder. Suppose someone argues, "abortion is the murder of an unwanted child and so should not be allowed". The word "murder" carries the connotation that the act is wrong, since murders are usually taken to be wrongful killings. As an argument against abortion it therefore begs the question as it presupposes that abortion is wrong, which is exactly what is to be proven. However, someone who is not careful and fails to detect the inappropriate negative connotation might easily be swayed by the argument.

Reification

The word "reify" came from the Latin word "res", which means thing. Reification is treating an abstract idea or property as if it were a concrete physical object. For example, one slogan on a popular TV programme says "The truth is out there." This treats truth as if it were a physical object that can either be in here or out there somewhere. But truth is an abstract property of claims and theories and is not located anywhere. So this is an example of reification. Of course, we know roughly what the intended meaning is. What is meant is probably something like "the truth about [a certain issue] is something that we can discover if we try hard enough." For a different example, consider the popular claim that "History is just." A person or a system of rules or laws can be just or unjust, but justice is not really a property of history, taken as a body of facts about what has happened in the past. But again we can guess what the speaker might have in mind when the statement is made. Perhaps the intended meaning is something like "in time people will make the correct and fair opinion on the matter under discussion."

The two examples here show that reification in itself need not be objectionable. It increases dramatic impact and is often used in poetry and metaphors. However, if our purpose is to convey information clearly and simply, then reification should perhaps be avoided. If a claim that involves reification constitutes a meaningful and informative claim, then it can be expressed more clearly in simpler language without using reification. When it is difficult if not impossible to carry out this translation, this is a good sign that the original statement does not actually have a clear meaning. So, in general, unless you want dramatic impact, avoid using reification. But if you have to, make sure you know what you really intend to say.

Category mistakes

This is the mistake of ascribing a property to some object which logically it cannot possess, or more generally, misrepresenting the category to which something belongs. Consider the famous sentence "colourless green ideas sleep furiously". This sentence contains a number of category mistakes, since green ideas cannot be said to be colorless, and ideas are not the kind of things that can sleep. Some years ago, the HKU Student Law Society puts up a slogan that says "we are the law". This is a category

mistake as laws are regulations and rules, and people are not. Of course, sometimes people do say "I am the law" to mean they are the boss and that everyone should obey whatever they command. But this goes against the idea of justice and rule-of-law which are central to modern democratic communities. Law students should know better than proclaim slogans like that.

6.   Basic logical concepts

Consistency

Two (or more) statements are inconsistent with each other when it is logically impossible for all of them to be true at the same time. For example, "The earth is flat", and "The earth is spherical" are inconsistent statements since nothing can be both flat and spherical. On the other hand, if you have any two statements that are both true, they are certainly consistent.

Entailment

A sentence X entails Y if Y follows logically from X. In other words, if X is true then Y must also be true, e.g. "30 people have died in the riots" entails "more than 20 people died in the riots", but not vice-versa.

If X entails Y and we find out that Y is false, then we should conclude that X is also false. But of course, if X entails Y and we find out that X is false, it does not follow that Y is also false.

If X entails Y but Y does not entail X, then we say that X is a stronger claim than Y (or "Y is weaker than X"). For example, "all birds can fly" is stronger than "most birds can fly", which is still stronger than "some birds can fly".

A stronger claim is of course more likely to be wrong. To use a typical example, suppose we want to praise X but are not sure whether X is the best or not, we might use the weaker claim "X is one of the best" rather than the stronger "X is the best". So we need not be accused of speaking falsely even if it turns out that X is not the best.

Logical Equivalence

If two statements entail each other then they are logically equivalent. For example, "everyone is ill" is equivalent to "nobody is not ill", and "cheap things are no good" is actually equivalent to "good things are not cheap". If two statements are logically equivalent, then necessarily they must always have the same truth value.

7.   Arguments

In ordinary usage, the word "argument" is often used to refer to a heated dispute between two or more parties. But in logic and critical thinking, the term has a different meaning. Here, an argument is taken to be a list of statements, one of which is the CONCLUSION and the others are the PREMISES or ASSUMPTIONS of the argument. To give an argument is to provide a set of premises as reasons for accepting the conclusion. The ability to construct, identify and evaluate arguments is a crucial part of critical thinking.

Here is an example of a short argument made up of three statements. The first two statements are the premises, and the last one is the conclusion:

- Every duck can swim.
- Donald is a duck.
- Donald can swim.

Arguments in real life often are not presented in such a neat manner, with the premises and conclusions clearly laid out. So how do we identify them? There are no easy mechanical rules, and we usually have to rely on the context in order to determine which are the premises and the conclusions. But sometimes the job can be made easier by the presence of certain premise or conclusion indicators. For example, if a person makes a statement, and then adds "this is because ...", then it is quite likely that the first statement is presented as a conclusion, supported by the statements that come afterwards. Words like "after all", "suppose" and "since" are also often used to precede premises, though obviously not in cases like "I have been here since noon". Conclusions, on the other hand, are often preceded by words like "therefore", "so", "it follows that". However,

sometimes the conclusion of an argument might not be explicitly written out. For example it might be expressed by a rhetorical question:

- How can you believe that corruption is acceptable? It is neither fair nor legal!

We might reconstruct the argument explicitly as follows:

- Corruption is not fair and it is not legal.
- So, corruption is not acceptable.

Good reading skills include the ability to reconstruct the arguments that are presented informally, and good writing and presentation skills include the ability to present arguments systematically and clearly.

8.   Validity and soundness

The idea of a VALID ARGUMENT is one of the most important concepts in critical thinking, so you should make sure you fully understand this topic. Basically, a valid argument is one where the premises entail the conclusion. In other words, a valid argument is one where it is necessarily the case that the conclusion is true if the premises are all true. So here is a valid argument:

- Barbie is over 90 years old. So Barbie is over 20 years old.

Obviously, if the premise is true, there is no way that the conclusion will be false. So the argument is indeed valid. Notice that the validity of the argument does not depend on whether the premise is in fact true. Even if Barbie is actually only 10 years old, the argument is still valid. Validity only requires that when the premises are true, so is the conclusion. It depends only on the logical connection between the premises and the conclusion. It does not depend on their actual truth or falsity. A valid argument can have false premises and a false conclusion. A valid argument can also have a false premise but a true conclusion, as when Barbie is 30 years old.

This, however, is not a valid argument. It is INVALID:

- Barbie is over 20 years old. So Barbie is over 90 years old.

The argument is not valid because it is possible that the premise is true and the conclusion is false, as when Barbie is 30 years old, or 80 years old. Call these situations COUNTEREXAMPLES to the argument. Basically, we are defining a valid argument as an argument with no possible counterexamples. To sharpen your skills in evaluating arguments, it is important that you are able to discover and construct counterexamples. Being able to provide counterexamples can help you convince other people that a certain argument is mistaken.

Notice that an invalid argument can have true premises and a true conclusion. The invalid argument above is an example if Barbie is 99 years old. Remember that true premises and a true conclusion are not sufficient for validity, because the logical connection between them is missing.

Notice that we are making a distinction between truth and validity. Statements (the premises and the conclusion) can be true or false, but they are not valid or invalid. Arguments might be valid or invalid, but they should never be described as true or false.

Soundness

Given a valid argument, all we know is that if the premises are true, so is the conclusion. But validity does not tell us whether the premises or the conclusion are true or not. If an argument is valid, and all the premises are true, then it is called a SOUND argument. Of course, it follows from such a definition that a sound argument must also have a true conclusion.

In discussion, it would be nice if we can provide sound arguments to support an opinion. This means showing that our argument is valid, and that the premises are all true. Anyone who disagree would have to show that our premises are not all true, or the argument is not valid, or both. This method of carrying out a rational discussion is something we should follow if we want to improve our critical thinking.

Hidden assumptions

When people give arguments sometimes certain assumptions are left implicit. Example :

- Homosexuality is wrong because it is unnatural.

This argument as it stands is not valid. Someone who gives such an argument presumably has in mind the hidden assumption that whatever that is unnatural is wrong. It is only when this assumption is added that the argument becomes valid.

Once this is pointed out, we can ask whether it is justified. We might argue for example, that there are plenty of things that are "unnatural" but are not usually regarded as wrong (e.g. playing video games, having medical operations, contraception). As this example illustrates, pointing out the hidden assumption in an argument can help resolve or clarify the issues involved in a dispute.

In everyday life, the arguments we normally encounter are often arguments where important assumptions are not made explicit. It is an important part of critical thinking that we should be able to identify such hidden assumptions or implicit assumptions. The way to do this is to see what additional assumptions are needed to add to an argument to make it valid.

9.   Patterns of valid arguments

Obviously valid arguments play a very important role in reasoning, because if we start with true assumptions, and use only valid arguments to establish new conclusions, then our conclusions must also be true. But how do we determine whether an argument is valid? This is where formal logic comes in. By using special symbols we can describe patterns of valid argument, and formulate rules for evaluating the validity of an argument. Below we introduce a few patterns of valid arguments. You should make sure that you can recognize these patterns and make use of them in reasoning.

Modus ponens

Consider the following arguments :

- If this object is made of copper, it will conduct electricity. This object is made of copper, so it will conduct electricity.
- If there is no largest prime number, then 510511 is not the largest prime number. There is no largest prime number. Therefore 510511 is not the largest prime number.
- If Lam is a Buddhist then he should not eat pork. Lam is a Buddhist. Therefore Lam should not eat pork.

These three arguments are of course valid. Furthermore you probably notice that they are very similar to each other. What is common between them is that they have the same structure or form:

- If P then Q. P. Therefore Q.

Here, the letters P and Q are called sentence letters. They are used to translate or represent statements. By replacing P and Q with appropriate sentences, we can generate the original three valid arguments. This shows that the three arguments have a common form. It is also in virtue of this form that the arguments are valid, for we can see that any argument of the same form is a valid argument. Because this particular pattern of argument is quite common, it has been given a name. It is known as MODUS PONENS.

However, don't confuse modus ponens with the following form of argument, which is not valid!

- Affirming the consequent - If P then Q. Q. Therefore, P.

Giving arguments of this form is a fallacy - making a mistake of reasoning. This particular mistake is known as affirming the consequent.

- If Jane lives in London then Jane lives in England. Jane lives in England. Therefore Jane lives in London.
- If Bing has gone shopping then Daniel will be unhappy. Daniel is unhappy. So Bing has gone shopping.

See if you can come up with situations where the premises of these

arguments are true but the conclusions false. They would show that the arguments are not valid.

Here are some other patterns of valid argument :

Modus tollens

- If P then Q. Not-Q. Therefore, not-P.

Here, "not-Q" simply means the denial of Q. So if Q means "Today is hot.", then "not-Q" can be used to translate "It is not the case that today is hot", or "Today is not hot."

- If Norah Jones is coming to Hong Kong today, the newspapers would have reported it. But there are no such reports in the newspapers, so Norah Jones is not coming to Hong Kong today.

But do distinguish modus tollens from the following fallacious pattern of argument :

- Denying the antecedent - If P then Q, not-P. Therefore, not-Q.

- If Elsie is competent, she will get an important job. But Elsie is not competent. So she will not get an important job.

Hypothetical syllogism

- If P then Q, If Q then R. Therefore, if P then R.

- If God created the universe then the universe will be perfect. If the universe is perfect then there will be no evil. So if God created the universe there will be no evil.

Disjunctive syllogism

- P or Q. Not-P. Therefore, Q ; P or Q, Not-Q. Therefore, P.

- Either the government brings about more sensible educational reforms, or the only good schools left will be private ones for rich kids. The

government is not going to carry out sensible educational reforms. So the only good schools left will be private ones for rich kids.

Dilemma

- P or Q. If P then R. If Q then S. Therefore, R or S.

When R is the same as S, we have a simpler form : P or Q. If P then R. If Q then R. Therefore, R.

- Either we increase the tax rate or we don't. If we do, the people will be unhappy. If we don't, the people will also be unhappy. (Because the government will not have enough money to provide for public services.) So the people are going to be unhappy anyway.

Arguing by Reductio ad Absurdum

The Latin name here simply means "reduced to absurdity". Here is the method to follow if you want to prove that a certain statement S is false:

- First assume that S is true.
- From the assumption that it is true, prove that it would lead to a contradiction or some other claim that is false or absurd.
- Conclude that S must be false.

Those of you who can spot connections quickly might notice that this is none other than an application of modus tollens. As an example, suppose someone claims that the right to life is absolute and that it is always wrong to kill a life, no matter what the situation is. Now assume that this is true. We would then have to conclude that killing for self-defense is also wrong. But surely this is not correct. If someone threatens your life and the only way to save yourself is to kill the attacker, then most people would agree that this is permissible, and it is recognized as such under the law. Since the original claim leads to an unacceptable consequence, we should conclude that the right to life is not absolute.

Other Patterns

There are of course many other patterns of deductively valid arguments.

Some are too obvious to mention, e.g.

- P and Q. Therefore Q.

It is understandable that you might not remember the names of all these patterns. What is important is that you can recognize these argument patterns when you come across them in everyday life, and that you can construct instances of these patterns.

10. Causation

The most important thing to remember about causation is probably the advice that one should not confuse correlation with causation.

Suppose events of type A are positively correlated with events of type B. One common mistake in causal reasoning is to jump to the conclusion that A is therefore the cause of B. This would be a premature inference because there are other alternative explanations which should be ruled out first:

The order of causation is reversed

Suppose we find out that people who use electronic diaries and computer address books tend to have worse memory. It is natural to think that deterioration of memory is caused by over-reliance on computer devices. But it might be the other way round. Perhaps there is such a correlation because people who do not have good memories (for genetic or other reasons) are more likely to rely on such devices.

The correlation events have a common cause

Suppose a study shows that married couples who have sex more often are less likely to get divorce. Should one therefore have more sex in order to avoid divorce? Before drawing such a conclusion, we have to consider the possibility that there might be a common cause underlying the correlated events. In this particular case, the reason for the correlation is perhaps just that if two persons love each other, they are more likely to have sex and less likely to separate. So love is the common cause behind the correlated

events. Simply having more sex might not make divorce less likely. Perhaps it has the opposite effect!

The correlation is a coincidence

A correlation provides evidence for causation only if the correlation is robust and can be observed repeatedly. Just because I have twice lost something on a black Friday does not warrant the conclusion that something spooky is at work. Similarly, a man who recovers from indigestion whenever he takes a certain Chinese medicine should not jump to the conclusion that the medicine causes him to get well. Perhaps his indigestion problems are relatively minor and they go away quickly whatever he does. So the apparent improvement is just a coincidence and the medicine does not provide any benefit at all. To see whether the medicine is really effective, the man should see what happens when he does not take the medicine, and whether varying the amount of medicine might have differential effects.

11. Morality

Morality is about what is right or wrong, and what should or should not be done, and what rights or duties we might have. As such morality is normative and not purely descriptive. Descriptive statements describe facts without any value judgments. The claim that "Your nose is longer than your ear" is a descriptive claim. No value judgment is involved since the statement says nothing as to whether what is described is good or bad. In contrast, the following claims are normative claims:

- A democratic society should not enact unjust laws.
- Abortion is permissible under certain situations.
- We should not discriminate against homosexuals.

Notice that descriptive claims about moral beliefs in themselves are not normative. The statement "Peter thinks that abortion is wrong" is a descriptive statement about one of Peter's beliefs. There is not judgment of whether Peter is right or wrong so this is not a normative claim.

Given that descriptive statements do not involve any moral judgments, we

should be careful of arguments that rely on purely descriptive assumptions to derive a normative conclusion. An example is to argue that cloning is wrong because it is unnatural. What counts as unnatural is not very clear, but if it is a matter of whether something occurs naturally in the environment, then the claim that something is or is not natural is a descriptive claim, and by themselves they have no normative consequences. This can be done only when normative assumptions like "unnatural things are wrong" are added.

Similarly, many people often argue that we ought to be selfish, or that animals can be used for food because this is what nature is like, or that evolution is a matter of survival of the fittest. Again these arguments jump from purely descriptive claims to normative conclusions. Just because something happened quite a lot does not mean that it should be done. Some animals kill the weak and the old, or leave them to die miserably, but this does not mean we should do the same thing. To infer a normative claim, you need to make assumptions about values or about what is right and wrong. It is a mistake to try to derive normative claims solely on the basis of descriptive claims. Such a mistake is known as THE NATURALISTIC FALLACY.

12. Fallacies

FALLACIES are mistakes of reasoning, as opposed to making mistakes that are of a factual nature. If I counted twenty people in the room when there were in fact twenty-one, then I made a factual mistake. On the other hand, if I believe that there are round squares, I am believing something that is inconsistent. This is a mistake of reasoning, and a fallacy, since I should not have believed something inconsistent if my reasoning is good.

Broadly speaking, we might divide fallacies into four kinds :

- Fallacies of inconsistency are cases where something inconsistent or self-defeating has been proposed or accepted, as in believing in the existence of round squares.
- Next we have the fallacy of inappropriate presuppositions. These are cases where we have an assumption or a question presupposing something that is not reasonable to accept in the

relevant conversational context. Asking whether human nature is good or evil presupposes that there is such a thing as human nature and that it must be either good or bad. But these assumptions might not be correct and if no adequate justification is offered then the question might not be an appropriate one.

- Fallacies of relevance are cases where an irrelevant assumption is used to defend a conclusion. For example, suppose a student failed a course and asked the teacher to give him a pass instead, because "otherwise I would not be able to find a good job". This is an example of the fallacy of irrelevance since grades should be given on the basis of performance only.
- Fallacies of insufficiency are cases where the evidence supporting a conclusion is insufficient or weak. The naturalistic fallacy is one example.

13. Going forward

What should we do to improve our critical thinking skills? Critical thinking is a skill. Like the acquisition of many other skills, there are three main factors involved in learning critical thinking : theory, practice, and attitude.

First, we need to learn the principles of critical thinking, such as some basic logic. We also need to know what typical fallacies people make in order to avoid them. We have summarized some of the main principles in this little booklet. However, merely knowing the principles that distinguish good and bad reasoning is not enough. One might acquire an understanding of the theories of good tennis, and yet fail to apply and make use of such theories in actual game play. Similarly, to improve critical thinking skills it is necessary to develop the ability to internalize the principles one have learnt in normal reasoning, and to develop the disposition and ability and apply such principles in daily life. But persistent practice can bring about improvements only if one has the right kind of motivation and attitude. Students who like to be spoon-fed and dislike challenges and having to find things out for themselves are not going to improve their own thinking. To improve one's thinking one must recognize that the importance of reflecting on the reasons for belief and action. One must also be willing to engage in debate, to admit having made mistakes, to break old habits, and to deal with linguistic complexities and abstract

concepts.

In this booklet we have discussed only a very small part of critical thinking. If you want to learn more you can look up these books and resources :

- Patrick Hurley (2003) *A Concise Introduction to Logic* 8th edition Wadsworth.

- Anthony Weston (2001) *A Rulebook for Arguments* 3rd edition Hackett.

- http://www.philosophy.unimelb.edu.au/reason/critical/ - "Tim van Gelder's critical thinking on the web", a directory of online resources related to critical thinking.

- http://philosophy.hku.hk/think - "Critical thinking web", a web site with online tutorials and exercises on critical thinking and creative thinking skills.

- End -