Deductive arguments are commonly used in various kinds of academic writing. In order to be able to perform a critique of deductive arguments, we will need to understand their basic structure.

As will be demonstrated in the following examples:

A deductive argument has a form whereby if the premises are true, it is impossible for the conclusion to be false.

In other words, even before we get to the conclusion we are given a clear picture of exactly where the argument is heading, and the ***inevitability*** of the conclusion.

We will consider two kinds of deductive argument:

(i) Categorical Deductive Arguments

(ii) Hypothetical Deductive Arguments

5.6.1 Formal validity in categorical deductive arguments

Categorical deductive arguments demonstrate how many members of one category (or set) can be said to also belong to another category. In this sense, they attribute universality or particularity to an object or state of affairs.

Since Aristotle – and until the end of the nineteenth century - categorical logic was thought to be the most effective way of making true statements and valid arguments. Such logic was based squarely on the subject-predicate formulation, used for making claims about an object or state of affairs without doubt, probability or speculation.

Categorical logic could not deal with hypothetical or conditional statements and because of this, although it is important, it has limited applications.

In categorical logic, the subject category is connected to the predicate category:

Subject Category	Predicate Category
All insects	are organisms with six legs
Some lawyers	are rich
No humans	are not mammals

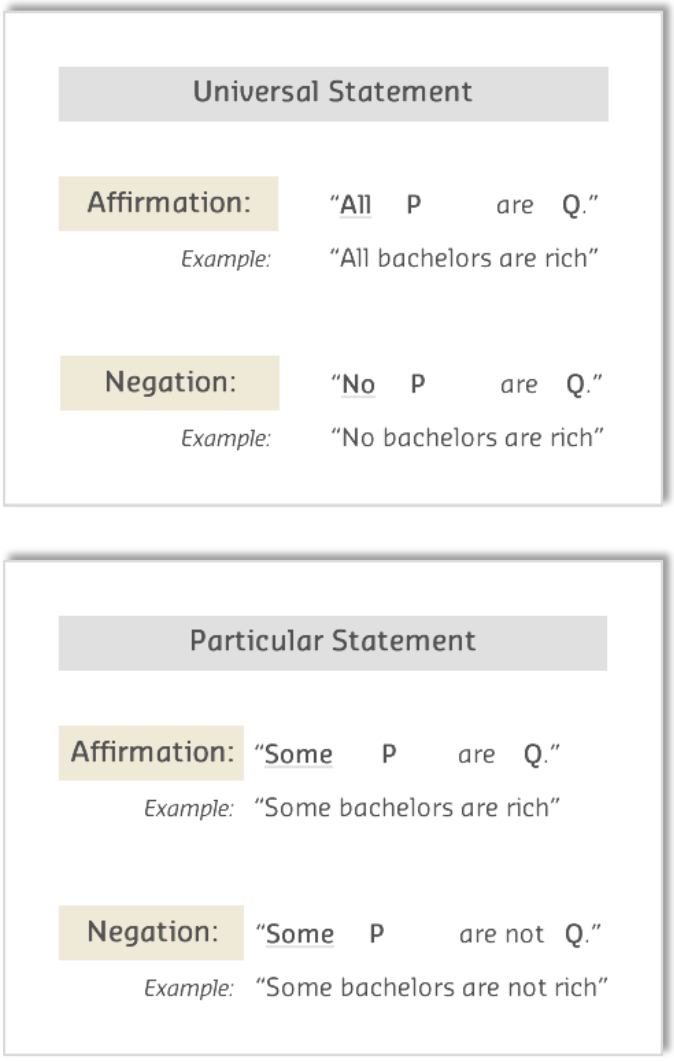
Since they are concerned with categories, the key terms in categorical logic are:

all, some, are, not.

For a statement to be categorical, it is not sufficient that it merely takes the simple subject-predicate form.

For example, the statement "Bachelors are rich.", only becomes categorical when it is amended to "All bachelors are rich."

Categorical statements are either universal or particular, and they either affirm or negate something:



Using such statements, a categorical deductive argument would take the following form:

Premise 1:	"All bachelors are rich."
Premise 2:	"John is a bachelor."
Conclusion:	"Therefore, John is rich."

The examples may be simple, but the point about these arguments is important: if the premises in a deductive argument are true, then the **FORM** of the argument dictates that **the conclusion must also be true**.

Now, let's look at a different kind of example, which contains both affirmative and negative categorical statements, and which is closer to the kind of argument that may be found in typical academic writing.

Remember, in this kind of argument, if the premises are true, then when have no choice but to accept that the conclusion is true - and, therefore, that the argument is valid.

NOTE: *(The following is an example only, and is not taken from any authentic source on this topic.)*

P **Q**

1. [All climate change sceptics] are [proponents of continuous economic growth].

Q **R**

2. [No proponents of continuous economic growth] are [proponents of the need for environmentally sustainable energy policies].

P **R**

3. [No climate change sceptics] are [proponents of the need for environmentally sustainable energy policies].

Premise 1:	All P are Q
Premise 2:	No Q are R
Conclusion:	No P are R

In this case, the conclusion is unavoidable.

The conclusion, that NO climate change sceptics are proponents of the need for environmentally sustainable energy policies is a significant claim – ***but must be accepted because of the FORMAL structure of the argument.***

However, if we want to challenge the validity of this argument, we can scrutinize, more closely, whether the premises provide acceptable support for the conclusion. We can do this by asking some questions:

1. What is the evidence that all climate-change sceptics are proponents of continuous economic growth?

2. How were these terms defined, and what are some of the hidden assumptions in these definitions? What are the denotations/connotations of the key terms in the argument?

Even if the premises are true (and the conclusion must therefore be true), **what happens to this validity if we challenge the truth of the premises, or challenge one particular premise as a starting point for the argument**?

As we have discussed, hypothetical arguments are another important form of deductive argument, and we can use some examples of hypothetical arguments to demonstrate how such arguments can be judged to be formally valid. If such arguments are judged as formally invalid, they are known as 'formal fallacies'.

Note:

Some terms in the following section may appear to be overly 'technical'. However, remembering and using such words can help to 'stretch' our thinking and conceptualization, and therefore improve our overall academic reading and writing skills.

5.6.2 Formal validity in hypothetical deductive arguments

Another kind of common deductive argument is known as the **hypothetical deductive argument**. We have seen that categorical deductive arguments are quite limited in their application. However, hypothetical arguments can be used much more widely. Virtually any argument can be cast in hypothetical form, so it is important that we look closely at the forms taken by both valid and invalid hypothetical arguments. We will respond to the question:

"How can we identify whether a hypothetical argument is valid or invalid?"

Hypothetical arguments are made up of hypothetical (otherwise known as 'conditional') statements. We can identify hypothetical arguments by the words:

'If' ... 'then'

If condition X is met, then Y will result.

The following are examples of hypothetical statements:

If you attend all the classes, then you will pass the exam.

If the door is open, then my husband must be home.

If we liberalise gun possession, then the number of violent crimes will increase.

Each statement has two parts, an antecedent (*what comes before*) comprising the first part, and a consequent (*what comes after)* comprising the second part. The antecedents and consequents of the above statements are detailed in the table below:

Antecedent	Consequent
"you attend all the classes"	"you will pass the exam"
"the door is open"	"my husband must be home"
"we liberalise gun possession"	"the number of violent crimes will increase"

Such kinds of statements can be expanded to form simple hypothetical arguments, comprised of two premises and a conclusion.

	antecendent (A) consequent (C)
Premise 1:	If you attend all the classes, then you will pass the exam.
	antecentent affirmed (AA)
Premise 2:	You have attend all the classes.
Conclusion:	Therefore, you will pass the exam.

In the above case, the antecedent is affirmed (AA), so the argument is valid.

The following argument is also valid (even though the conclusion changes) if the consequent is denied:

	antecendent (A) consequent (C)
Premise 1:	If you attend all the classes, then you will pass the exam.
	antecentent affirmed (DC)
Premise 2:	You did not pass the exam.
Conclusion:	Therefore, you did not attend all the classes.

From the above examples, we can identify a simple rule for checking the validity of a simple hypothetical argument.

An argument is valid if it affirms the antecedent or denies the consequent.

Affirming the Antecedent	**(A A)**
Denying the Consequent	**(D C)**

5.6.3 Formal Invalidity (Formal Fallacy)

If a hypothetical deductive argument is invalid due to its form, it can be described as displaying a formal fallacy. An important part of the process of critique of arguments is to detect formal fallacies.

The following are examples of formally invalid arguments, otherwise known as formal fallacies:

Example A

	antecendent (A) consequent (C)
Premise 1:	If we do not close the window, the chair will get wet.
	antecentent affirmed (CA)
Premise 2:	The chair is wet.
Conclusion:	Therefore, we did not close the window.

Explanation: The argument is invalid – the chair could have become wet by other causes.

Example B

	antecendent (A) consequent (C)
Premise 1:	If his face turns red, then he is lying.
	antecentent denied
Premise 2:	His face hasn't turned red.
Conclusion:	Therefore, he is not lying.

Explanation: The argument is invalid – he may still be lying, even without a change in face colour.

These examples show that we can identify the following simple rule for determining whether a three-part hypothetical argument is valid:

VALID	Affirming the Antecedent	(A A)
	Denying the Consequent	(D C)
INVALID	Affirming the Consequent	(A C)
	Denying the Antecedent	(D A)

5.6.4 Formal Fallacy

If a hypothetical deductive argument is invalid due to its form, it can be described as displaying a formal fallacy. An important part of the process of critique of arguments is to detect formal fallacies.

Activity: Have a go at Activity One on the right-hand side of the screen.

5.6.5 Hypothetical Chain Arguments

A hypothetical chain argument is a series of hypothetical arguments in which the conclusion of one argument is used as a premise in a second argument.

P Q
If the government increases personal income taxes, then the disposable income of consumers

Q
will decrease. If disposable income decreases, then consumer spending will decline and the

D P
corporate tax revenues will decline. So, if the government increases personal income tax,

D
corporate tax revenues to government will decline.

R
However, because of an increased corporate tax rate, government revenue has recently risen.

So, even if the government increases personal income taxes, this action will
D
lead to a decline in overall revenue.

¬ P
Therefore, it is concluded that the government should be advised NOT to increase personal income taxes.

Represented formally

	(i)	If P, then Q.	$P \Rightarrow Q$
Argument 1	(ii)	If Q, then D.	$Q \Rightarrow D$
	(iii)	So, if P, then D.	$P \Rightarrow D$
	(iv)	R.	R
	(v)	If R, then not D.	$R \Rightarrow \neg D$
Argument 2			
	(vi)	So, not D.	$\neg D$

DECISION:	(vii)	Therefore, not P	Therefore, $\neg P$

We have now considered some basic procedures in identifying arguments, performing a critique of methodology and methods, identifying the differences between natural language and formal language, identifying arguments and how to perform a critique of formal validity in categorical and hypothetical deductive arguments.

In the next section, we will focus on other important kinds of argument used in academic writing, namely inductive, conductive and abductive arguments.

