**Identifying Arguments**

**What is an Argument?**

*In logic* an ***argument*** is a sequence of statements of which one is intended as a***conclusion*** and the others (known as ***premises***) are intended to provide support for, or reasons to believe, the conclusion. For example:

Premise one: All men are mortal

Premise two: Socrates is a man

Conclusion: therefore, Socrates is mortal

Arguments like the one above can be written in an abbreviated style known as ***standard form***:

All men are mortal

Socrates is a man

∴ Socrates is mortal

All arguments can be thought of as falling into one of two categories: arguments in which the premises do support the conclusion, and arguments in which the premises do not support the conclusion. The former group are called ‘**good arguments**’ and the latter group are called ‘**bad arguments**’.

The purpose of logic, as the science that evaluates arguments, is thus to develop methods and techniques that allow us to distinguish good arguments from bad. (Hurley, 2003: 1)

Premises and conclusions are always **statements** or **propositions** (depending on how you view them), rather than questions, commands or exclamations. Statements and propositions are always true or false (although we may not know which they are). The following are examples (taken from Hurley, 2003: 1) of statements (assertions that are either true or false and are typically expressed in **declarative sentences**):

1. Aluminium is attacked by hydrochloric acid.
2. Broccoli is a good source of vitamin A.
3. Argentina is located in North America.
4. Napoleon prevailed at Waterloo.
5. Rembrandt was a painter and Shelley was a poet.

The first two statements are true, the second two are false, and the last statement is actually two statements, both of which are true.

True and false are known as the two possible **truth values** of statements. Therefore, the truth values of the statements above are true, true, false, false, and the truth values of both the last statement and each of its component statements is true.

There are many kinds of sentences that cannot be regarded as either true or false, for example, suggestions, questions, commands, proposals, and exclamations. The following sentences (which are examples taken from Hurley, 2003: 2) are *not* statements (because none of them are true or false):

1. What is the atomic weight of carbon? (question)
2. Let’s go to the park today. (proposal)
3. We suggest that you travel by bus. (suggestion)
4. Turn to the left at the next corner. (command)
5. All right! (exclamation)

An argument contains one or more premises and *only one* conclusion. The premises are intended to be reasons or evidence for the conclusion, and the conclusion is the statement that the reasons or evidence are intended to support or imply. The conclusion is, therefore, claimed to **follow from** the truth of the premises.

The following is an example (from Hurley, 2003: 2) of an argument:

All crimes are violations of the law.

Theft is a crime.

∴ Theft is a violation of the law.

In this example, the first two statements are the premises and the final statement is the conclusion. Here, the premises do support the conclusion, so this is a good argument.

Consider the following argument, which is also from Hurley (2003: 2):

Some crimes are misdemeanours.

Murder is a crime.

∴ Murder is a misdemeanour.

This is a bad argument because the premises do not support the conclusion despite the fact that they are intended to.

**Identifying arguments**

There are a number of words and expressions that frequently indicate the presence of a conclusion in some text or speech. Those are known as ***conclusion indicators*** and include the following:

therefore… thus…

hence… so…

consequently… which proves that…

justifies the belief that… I conclude that…

which implies that… which allows us to infer that…

it follows that… … establishes the fact that…

… demonstrates that… wherefore…

we may infer… accordingly…

we may conclude that… it must be that…

for this reason… entails that…

hence… as a result…

There are also a number of words and expressions that frequently indicate the presence of a premise in some text or speech. Those are known as ***premise indicators*** and include the following:

for… since…

because… assuming that…

follows from the fact that… the reason being…

First,… second,… (etc.) may be inferred from the fact that…

As indicated by… in that…

As… given that…

Seeing that… for the reason that …

Inasmuch as … owing to…

Consider the following two arguments:

He is not at home, so he has gone to the movie.

He is not at home, since he has gone to the movie.

In the first argument ‘so’ is a conclusion indicator which tells us that ‘he has gone to the movie’ is a conclusion supported by the premise ‘he is not at home’.

In the second argument ‘since’ is a premise indicator which tells us that ‘he has gone to the movie’ is a premise supporting the conclusion ‘he is not at home’.

However, the words and expressions that are ***inference indicators*** (the collective term for premise indicators and conclusion indicators) do not always function as such. For example, a word such as ‘since’ is an inference indicator in some contexts, but not in all contexts. In the sentence ‘It has been three years since the last Olympic Games’, the word ‘since’ is not an inference indicator, but rather indicates duration. Hurley (2003: 14) illustrates this point when he gives the example of the following passages:

Since Edison invented the phonograph, there have been many technological developments.

Since Edison invented the phonograph, he deserves credit for a major technological development.

Another example of the different uses of terms making it more difficult to identify inference indicators is the following:

1. John broke the window because he tripped.

2. John broke the window because he had forgotten his key.

3. John must have broken the window because he was the only person in the house.

In the first two cases the word ‘because’ is not an inference indicator, but it is in the third case. In the first case ‘because’ indicates causation. In the second case it indicates the reason for John’s actions, and in the third case it indicates an inference in which the conclusion that John broke the window is based on the premise that he was the only person in the house.

Modal terms such as ‘must’, ‘cannot’, ‘impossible’ and ‘necessary’ also help indicate inference.

Some arguments contain no inference indicators. In such cases we must rely on contextual clues or our understanding of the intentions of the author or speaker to enable us to differentiate between premises and conclusions.

It can also be the case that a single indicator can identify more than one premise (for example, ‘as it is the case that … and …’ – the ellipses indicate where the premises would be).

Sometimes the conclusion is omitted from an argument and simply inferred. For example, ‘All boxers suffer brain damage and Smith had a long career as a boxer’.

Sometimes one or more premises (reasons) will be omitted, usually being taken for granted.

When reconstructing an argument or laying it out in standard form, one should try to keep the phrasing of the premises and the conclusion as close as possible to the original while also making sure that each premise and the conclusion are complete sentences and are meaningful in the order in which they are given.

It is important to remember that an argument does not contain any statements that are neither premises nor conclusions in the argument. There may be other statements that are part of a text or are spoken that are statements and are true or false, but that are not part of the reasoning that constitutes the argument because they are parenthetical to the movement of thought that constitutes the argument.

In simply *identifying* an argument it does not matter whether the argument is true or false, or a good or bad argument.

Sometimes the terms ‘argument’ and ‘inference’ are used interchangeably, but strictly speaking an **inference** is ‘the reasoning process expressed by an argument’ (Hurley, 2003: 5). Equally, the terms ‘statement’ and ‘proposition’ are frequently used interchangeably, but a **proposition** is technically (roughly speaking) ‘the meaning or information content of a statement’ (Hurley, 2003: 5).

Not all passages contain an argument. Hurley (2003: 13) stresses that for a passage to contain an argument at least two conditions must be fulfilled:

1. At least one of the statements must claim to present evidence or reasons.
2. There must be a claim that the alleged evidence or reasons supports or implies something – that is, a claim that something follows from the alleged evidence.

As statements that claim to present evidence or reasons are premises, and claims that evidence or reasons support are conclusions, then this amounts to saying that for a passage to contain an argument it must contain at least one premise and one conclusion.

It is not necessary, however, that any premises present anything that is *really* evidence or *actually* a reason, nor is it necessary that the premises in fact support the conclusion. All that is required is that the premises *claim* to present evidence or reasons, and that there is a *claim* that something follows from the alleged evidence or reasons.

Premises are **factual claims**, and the decision as to whether those claims are true or false frequently falls outside the realm of logic. A claim that some alleged evidence or reason supports a conclusion is an **inferential claim**. An inferential claim is one which states that something supports or implies something else or, to put it another way, that something follows from something. Inferential claims can be either explicit or implicit.

An **explicit inferential claim** can usually be identified by inference indicators (premise and conclusion indicators). An **implicit inferential claim** does not contain inference indicators, but does exhibit an inferential relationship between statements in the passage.

The identification of inferential relationships is a matter of interpretation. As a consequence, there will be cases where there is no general agreement as to whether a passage contains an inferential relationship. Hurley (2003: 15) points out that ‘[s]ometimes the only answer possible is a conditional one: “*If* this passage contains an argument, then these are the premises and that is the conclusion”.’

**Deduction and Induction**

Arguments can be regarded as one of two kinds: deductive or inductive. A **deductive argument** is one in which the person making the argument claims that it is *impossible* for the conclusion to be false if the premises are true. In other words, in a deductive argument it is claimed that the conclusion *necessarily* follows from the truth of the premises.

An **inductive argument** is one in which the person making the argument claims that it is *improbable* that the conclusion could be false if the premises are true. In other words, in an inductive argument it is claimed that the conclusion *probably* follows from the truth of the premises.

Deductive arguments involve *necessary* reasoning, whereas inductive arguments involve *probabilistic* reasoning.

Hurley (2003: 31-32) gives the following examples:

**Deductive argument**

The meerkat is a member of the mongoose family.

All members of the mongoose family are carnivores.

Therefore, it necessarily follows that the meerkat is a carnivore.

**Inductive argument**

The meerkat is closely related to the suricat.

The suricat thrives on beetle larvae.

Therefore, probably the meerkat thrives on beetle larvae.

The difference between a deductive and an inductive argument lies in the strength of the inferential claim in each case. The claim that the conclusion follows from the premises being true in the case of a deductive argument is stronger than the equivalent claim in an inductive argument.

However, in most arguments there is no clear statement to indicate the strength of the inferential claim. As a consequence, interpretation and evaluation is necessary in order to determine whether an argument is deductive or inductive. Hurley (2003: 32) outlines three criteria that are of relevance in determining the strength of an inferential claim (and therefore of determining whether an argument is deductive or inductive):

1. The occurrence of special indicator words.
2. The *actual* strength of the inferential link between premises and conclusion.
3. The form or style of argument.

**1. Inductive and deductive indicator words**

**Inductive indicators** include: ‘probably’, ‘improbable’, ‘plausible’, ‘implausible’, ‘likely’, ‘unlikely’, and ‘reasonable to conclude’.

**Deductive indicators** include: ‘necessarily’, ‘certainly’, ‘absolutely’ and ‘definitely’.

The phrase ‘it must be the case that’ is ambiguous because ‘must’ can be thought of as indicating either probability or necessity. In cases of the use of phrases such as this that contain ‘must’ it is necessary to pay particular attention to contextual clues to determine whether the argument is inductive or deductive.

Deductive and inductive indicator words should probably be ignored in cases where they conflict with one of the other criteria for determining whether an argument is deductive or inductive. This is because some people have a tendency to use phrases containing these indicator words for rhetorical purposes or to claim to ‘deduce’ a conclusion when in fact their argument should be regarded as inductive.

**2. The *actual* strength of an inferential link between premises and conclusion**

If a conclusion really does follow of necessity from the truth of the premises, then it should be regarded as a deductive argument. Equally, if the conclusion only probably follows from the truth of the premises, then it should be regarded as an inductive argument. Hurley (2003: 32) gives the following two examples:

All sales women are extroverts.

Elizabeth Taylor is a saleswoman.

Therefore, Elizabeth Taylor is an extrovert.

The vast majority of sales women are extroverts.

Elizabeth Taylor is a saleswoman.

Therefore, Elizabeth Taylor is an extrovert.

In the first example the conclusion follows of necessity from the truth of the premises. If *all* sales women *really are* extroverts, and Elizabeth Taylor *really is* a saleswoman, then it follows of necessity that Elizabeth Taylor is an extrovert. This argument is therefore deductive.

In the second argument the conclusion does not follow *of necessity* from the truth of the premises, although we might reasonably say that it *probably* follows from the truth of the premises. If the vast majority of saleswomen are extroverts and Elizabeth Taylor is a saleswoman, then there is a high probability (although not a certainty) that Elizabeth Taylor is an extrovert. This argument should therefore be regarded as an inductive argument.

**3. The form or style of argument**

**Typical forms for deductive arguments**

Hurley (2003: 33-34) outlines five forms of argumentation that are typically deductive: arguments based on mathematics, arguments from definition, categorical syllogisms, hypothetical syllogisms, and disjunctive syllogisms.

**Arguments based on mathematics**: in such arguments the conclusion depends on a purely arithmetic or geometric calculation or measurement. For example, if someone has £10, and is then given £20, they may conclude that they have £30. Equally, a surveyor may measure a square room and, after establishing that each wall is 10 feet long, conclude that it contains 100 ft.²

As all arguments in pure mathematics are deductive, most arguments that depend on mathematics are also deductive. A significant exception, however, is arguments that depend on statistics. Those arguments are usually best interpreted as being inductive.

**Arguments from definition**: in such arguments the conclusion is claimed to follow purely from the definition of some word or expression that appears in the premises. For example, someone might argue that if John is a bachelor, then it follows that he is unmarried. Hurley (2003: 33) gives examples based on the words ‘mendacious’ and ‘prolix’. If someone is mendacious, then one can conclude that they tell lies. Equally, if a certain paragraph is prolix, then it follows that it is excessively wordy.

In all three examples here, the conclusion follows because of the meaning of a word (‘bachelor’, ‘mendacious’ and ‘prolix’) that appears in the premise.

**Syllogisms**: arguments that contain exactly two premises and one conclusion.

**Categorical syllogisms**: roughly speaking, ‘a categorical syllogism is a syllogism in which each statement begins with one of the words “all,” “no,” or “some”’ (Hurley: 2003: 33). Hurley (2003: 33) gives the following example:

All lasers are optical devices.

Some lasers of surgical instruments.

Therefore, some optical devices are surgical instruments.

Arguments with this form are almost always best regarded as deductive.

**Hypothetical syllogisms**: syllogisms having a conditional statement (if … then …) as one or both of its premises. For example (from Hurley, 2003: 33):

If electricity flows through a conductor, then a magnetic field is produced.

If a magnetic field is produced, then a nearby compass will be deflected.

Therefore, if electricity flows through a conductor, then a nearby compass will be deflected.

If quartz scratches glass, then quartz is harder than glass.

Quartz scratches glass.

Therefore, quartz is harder than glass.

While it is the case that some arguments with this form can be interpreted as inductive, it is usually most appropriate to interpret hypothetical syllogisms as deductive.

**Disjunctive syllogisms**: syllogisms containing a disjunctive statement as one of the premises. Disjunctive statements are ‘either … or …’ statements. For example (from Hurley, 2003: 34):

Either breach of contract is a crime or it is not punishable by the state.

Breach of contract is not a crime.

Therefore, it is not punishable by the state.

Again, disjunctive syllogisms are usually best regarded as deductive.

**Typical forms for inductive arguments**

The premises in an inductive argument are typically concerned with relatively familiar subjects, and the conclusion usually moves beyond that which is familiar to that which is less well known.

Hurley (2003: 34-35) outlines six forms of argumentation that are typically inductive (although there are others): predictions about the future, arguments from analogy, inductive generalizations, arguments from authority, arguments based on signs, and causal inferences.

**Predictions**: predictions need not be arguments, but when they are, they are arguments that make a claim about the future on the basis of our knowledge of the past. As the future cannot be known with certainty, predictions, when they are arguments (as opposed to statements of the form ‘I think that … might happen’) are usually best regarded as inductive arguments.

**Arguments from analogy**:an argument that depends on an analogy or some such similarity between two things or states of affairs. The inference in such arguments is that the analogy shows that a specific condition that affects the thing or state of affairs that we know most about, also affects the thing or state of affairs that we know less well.

Hurley (2003: 34) gives the example of two Porsches. If Christina’s car handles very well, then someone might argue that it follows that Angela’s car must also handle well. This argument is dependent on the similarity, or analogy, between the two cars (they are both Porsches). Any certainty that one might have as a result of this inference is clearly probabilistic at best, and the argument is therefore inductive.

**Inductive generalizations**:an argument that makes a claim about a whole group on the basis of some knowledge of a selected sample. The inference is based on the idea that as members of the sample group share certain characteristics, then all members of the whole group must share the same characteristics.

Hurley (2003: 34) gives two examples:

1. If three oranges selected from a certain crate were especially tasty and juicy, then someone might argue that all the oranges from that crate are especially tasty and juicy.
2. Because six out of a total of nine members sampled from a certain labour union intended to vote for Johnson for union president, two-thirds of the entire membership intended to vote for Johnson.

The examples here are illustrations of the use of statistics in inductive arguments.

**Arguments from authority**:an argument with claims that something is true because an expert or a witness said that it is. As the expert or the witness could be either mistaken or lying, arguments from authority are probabilistic, and therefore inductive.

**Arguments based on signs**: an argument that proceeds from knowledge of a given sign to knowledge of the thing that the sign signifies. As Hurley (2003: 35) stresses:

The word “sign,” as it is used here, means any kind of message (usually visual) produced by an intelligent being.

Road signs are an obvious example here: if one sees a road sign that signifies that there are bends on the road ahead, then one might infer that there are indeed bends on the road ahead.

However, as the sign could have been moved or misplaced, so the inference is probabilistic, and therefore inductive.

**Causal inferences**: arguments that proceed from knowledge of a cause to knowledge of an effect, or, conversely, from knowledge of an effect to knowledge of a cause. For example, (from Hurley, 2003: 35):

1. From the knowledge that a bottle of wine had been accidentally left in the freezer overnight, someone might conclude that it had frozen (cause to effect).
2. After tasting a piece of chicken and finding it dry and crunchy, one might conclude that it had been overcooked (effect to cause).

As it isn’t possible to know specific instances of cause and effect with absolute certainty, then it is usually best to interpret such arguments as inductive.

Hurley (2003: 35) warns that:

It should be noted that the various subspecies of inductive arguments listed here are not intended to be mutually exclusive. Overlaps can and do occur. For example, many causal inferences that proceed from cause to effect also qualify as predictions. The purpose of this survey is not to demarcate in precise terms the various forms of induction but rather to provide guidelines for distinguishing induction from deduction

**Odd Cases**

**Arguments in geometry**: arguments in geometry are *always* deductive. Someone might confuse arguments in geometry with arguments from analogy or inductive generalisations because they might think that an inference about some property of a triangle (say, that it has a right angle) is based on the fact that another triangle that is congruent with the one under consideration also has that property (thereby mistaking it for an argument from analogy).

Equally, someone might think that an inference about some property of a triangle (say, that the angles total 180°) is based on the fact that all triangles have that property (thereby mistaking it for an inductive generalisation).

Arguments in geometry are always deductive because the conclusion necessarily follows with absolute certainty from the premises.

**Scientific arguments**: scientific arguments can be either inductive or deductive, depending on the circumstances. Generally, arguments that aim to discover a law of nature are regarded as inductive. Hurley (2003: 35) gives the following example:

We want to discover a law that governs the time required for a falling body to strike the Earth. We drop bodies of various weights from various heights and measure the time it takes them to fall. Comparing our measurements, we notice that the time is approximately proportional to the square root of the distance. From this we conclude that the time required for any body to fall is proportional to the square root of the distance through which it falls. Such an argument is best interpreted as an inductive generalisation.

Arguments that involve the application of known laws to specific circumstances are usually considered to be deductive arguments (with certain reservations). Hurley (2003: 36) gives the following example:

We want to apply Boyle’s law for ideal gases to a container of gas in our laboratory. Boyle’s law states that the pressure exerted by a gas on the walls of its container is inversely proportional to the volume. Applying this law, we conclude that when we reduce the volume of our laboratory sample by half, we will double the pressure. Considered purely as a mathematical computation, this argument is deductive. But if we acknowledge the fact that the conclusion pertains to the future and the possibility that Boyle’s law may not work in the future, then the argument is best considered inductive.

The reservation here is, therefore, very important. The application of known scientific laws is not the same as reasoning about analytic truths (things that are true as a result of the meaning of the relevant terms) because it is possible that a known scientific law could fail to be true at some point in the future. As a consequence, the application of known scientific laws is, strictly speaking, a matter of inductive reasoning even if the mathematical reasoning that forms part of the application of a law is, itself, deductive.

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**Further Reading**

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