

**University of London M.A. 2001-2**  
**Logic**  
**(BBK and KCL M.A. Conversion students)**

**Lecture 1 (12/11/01)**  
**What is Logic?**

**Reading:** LL, chs. 1, 2. (Optional: Sainsbury, ch.1; Hodges, chs. 1-3.)

**1. Some transitions in thought and speech:**

- (1) It's raining.  
I like rain.  
I like cake.  
Cake is made of eggs and flour.
- (2) It's raining.  
It rained yesterday.  
It rained the day before yesterday.  
So, it'll rain tomorrow.
- (3) It's raining.  
If it's raining and I don't have an umbrella, I'll get wet.  
I don't have an umbrella.  
So, I'll get wet.

We can explain why the transitions in (1) occur. But the first three thoughts (or claims) provide (and are intended to provide) no *reason* for thinking (agreeing to) the fourth thought (or claim). They are not intended to *make reasonable*, or to serve in an *argument* for, the fourth thought (or claim).

By contrast, the first three thoughts (/claims) in (2) and (3) to the fourth thoughts (/claims) in (2) and (3) are intended to make reasonable, to serve in an argument for, the fourth thoughts.

**First distinction:** *arguments*/other types of transition in thought or speech.

Arguments consist in *premises*, followed by a transition marker (e.g., 'so', 'therefore',

'hence', etc.), followed by a *conclusion*. Logic is concerned with the study of arguments.

We might write arguments in a uniform way, with numbered premises, followed by a transition marker (a line, '\_\_\_\_\_'), followed by a conclusion. (2), (3) becomes (4), (5);

(4)	(P1)	It's raining	(premise)
	(P2)	It rained yesterday	(premise)
	(P3)	It rained the day before yesterday	(premise)
		_____	(inference or transition
		marker)	
	(C)	It'll rain tomorrow	(conclusion)

(5)	(P1)	It's raining	(premise)
	(P2)	If it's raining and I don't have an umbrella, I'll get wet	(premise)
	(P3)	I don't have an umbrella	(premise)
		_____	(inference or transition
		marker)	
	(C)	I'll get wet	(conclusion)

## 2. Inductive arguments and deductive argument.

These are really different modes of assessment for arguments, rather than different types of argument (though one might intend an argument to be construed or assessed in one way rather than the other).

**Second distinction:** Inductive arguments and deductive arguments. When we assess an argument *qua* inductive argument, we attempt to determine whether the truth of the premises makes *probable* the truth of the conclusion. (4) is naturally construed as an inductive argument, as are (arguably) many arguments offered in the natural sciences. The study of inductive arguments is outside the scope of this course, but can be undertaken in *Epistemology and Methodology*.

When we assess an argument *qua* deductive argument, we attempt to determine whether the truth of the premises *guarantees* the truth of the conclusion. (5) is naturally construed as a deductive argument. An argument with this property is called a *valid* argument. (Is (5) a valid argument? Is it such that, if its premises are true, its conclusion *must* be true? Is (4) a valid argument?)

Logic is concerned with the study of *deductive* arguments. In other words, logic is concerned with methods for assessing the validity of arguments and with methods for constructing valid arguments.

### 3. Validity and possibility

We said that an argument is valid just in case the truth of the premises guarantees the truth of the conclusion. Another way of putting this is as follows:

An argument is valid just in case it is not possible for all the premises of the argument to be true and the conclusion false.

Consider (6):

- (6)     (P1)   All oak trees have roots.  
          (P2)   All the trees that grow in England have roots.
- 
- (C)    Some oak trees grow in England.

Is (6) valid? No. Why not? In order to be valid, (6) would have to be such that it was not *possible* for (P1) and (P2) to be true while (C) is false. Now (P1) is true, (P2) is true, and (C) is true. Doesn't that suffice for validity? No. It is possible for (P1) and (P2) to be true while (C) is false. (Can you think of a possible case in which that would happen?)

**Third distinction:** Arguments where, *as a matter of fact*, the conclusion is true and the premises are true (such arguments may or may not be valid) and valid arguments, arguments where (whether or not the conclusion and premises are true) there is no *possible case* in which the premises are true and the conclusion is false.

Consider (7):

- (7)     (P1)   If the Earth is round, then many things would just fall off it.  
          (P2)   Things do not just fall off the Earth.
- 
- (C)    The Earth is not round.

Is (7) valid? Why? Even though the conclusion of (7) is false, that doesn't show that the

argument is not valid, or *invalid*. In order to show that, we would need a case in which *both* the conclusion is false *and* the premises are true. Suppose then that (P1) and (P2) are both true. Is it consistent with that supposition that (C) is false? No. (7) is valid.

**Now construct an argument in which:**

- (i) All the premises are false, the conclusion is true, the argument is *valid*.
- (ii) All the premises are false, the conclusion is true, the argument is *invalid*.
- (iii) All the premises are false, the conclusion is false, the argument is *valid*.
- (iv) All the premises are false, the conclusion is false, the argument is *invalid*.

**Fourth distinction:** arguments where, as a matter of fact, the premises are false and the conclusion is true or false (these arguments may or may not be valid) and arguments where it is possible for the premises all to be true and the conclusion false (i.e., *invalid* arguments).

#### 4. Why study logic? (There are lots of reasons; I mention only two.)

1. Validity is an enormously useful property of arguments. Suppose you know that the following argument is valid (it is):

- or
- (P1) If Tony Blair won and inflation is rising, then more hospitals are closing  
interest rates are falling
  - (P2) Tony Blair won
  - (P3) Inflation is rising
  - (P4) It's not the case that interest rates are falling
- 
- (C) More hospitals are closing

(A) Suppose that you find out, by serious empirical inquiry, that all the premises are true. What are you now in a position to determine with no further empirical inquiry? You are in a position to determine that (C) is true!

(B) Suppose, by contrast, that you find out, by serious empirical inquiry, that the conclusion is false. What are you now in a position to deduce with no further empirical inquiry? That at least one of (P1)-(P4) is false!

That seems like a useful property for an argument to have.

2. The very same property that makes validity useful makes it philosophically interesting. How can arguments have the twin properties described above ((A) and (B))?

## 5. Formal validity

Consider (8), (9), (10)

- (8) (P1) If it is raining, then I'll get wet  
(P2) It is raining

---

(C) I'll get wet

- (9) (P1) If Jenny is quick, then she'll win the race  
(P2) Jenny is quick

---

(C) She'll win the race

- (10) (P1) If Tony Blair smokes, then the conservative (?) will win  
(P2) Tony Blair smokes

---

(C) The conservative (?) will win

(8)-(10) are all valid arguments. Do they have anything else in common? Look in particular at the *structures* of the three arguments.

Each of (8)-(10) have the following structure:

(P1) If ....., then \*\*\*\*\*  
(P2) .....

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\*\*\*\*\*

Indeed, any argument with that structure or *form* is valid. We might say that (8)-(10) are valid *in virtue of* the form or structure they share.

Now consider (11):

- (11) (P1) John is a bachelor

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(C) John is an unmarried man

Is (11) valid? Yes. It is impossible for it to be true that John is a bachelor and false that John is an unmarried man. Is (11) true in virtue of its form? No. (12) has the same form, but is *invalid*:

(12) (P1) John is a farmer  

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(C) John is an unmarried man

Intuitively, (11) is valid not in virtue of its form (or not *solely* in virtue of its form). Rather, the validity of (11) is sustained by some feature of one of the expressions in (P1) (perhaps its meaning or content): the word 'bachelor' is such that it cannot be truly applied to someone unless they are an unmarried man. Now look back at (8)-(10). Is it true that the validity of these arguments is sustained just by their shared form? No. It is sustained also by some feature of the words 'if' and 'then' (perhaps their meaning or content).

In order to carve out a particular subject matter, logicians typically distinguish words like 'bachelor' from words like 'if' and 'then' (and 'and', 'or', 'not', etc.). We call the latter *logical constants*. (They are called 'constants' because they are understood in the same way in all contexts; this will mean more to you later on in the course).

**Fifth distinction:** *logical constants*/all other expressions.

**Sixth distinction:** arguments whose validity is owed just to their form or structure and the contribution made by the logical constants or *formally valid* arguments/all other valid arguments.

Logic is concerned with the study of formally valid arguments, arguments whose validity is owed to structure + the role of the logical constants.

Why? This is a very difficult question to answer. There are really two related questions:

(Q1) Why is logic concerned only with the study of formal validity, validity owing to structure and logical constants?

(Q2) Given that logic has that concern, why does the list of logical constants include all and only the expressions it does?

The pragmatic answer to these questions, very broadly, is that arguments with the properties in question form a tractable subject matter. As we will see, it is possible to study formal validity in theoretically satisfying ways. It is not clear that the same is true of validity, broadly construed.

The substantive answer is harder to give. Logicians (or, at least, philosophers of logic) like to think that there is some deeper rationale behind the choice of constants (hence of subject matter). Put simply, they like to think that the distinction between logical constants and other expressions carves at a natural joint. However, there is no consensus concerning the nature of that joint. One thought is that logical constants are *topic-neutral*, that they bring no special subject matter into the sentences or propositions in which they participate. But that is far from satisfying. We won't be dealing with these questions in any detail here. I raise them only for your discomfort.

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