Glossary for Logic: The Language of Truth

This glossary contains explanations of key terms used in the course. (These terms appear in bold in the main text at the point at which they are first used.)

To make this glossary more easily searchable, the entry headings has '::' (two colons) before it. So, for example, if you want to find the entry for 'truth-value' you should search for ':: truth-value'.

:: Ambiguous, Ambiguity : An expression or sentence is ambiguous if and only if it can express two or more different meanings. In logic, we are interested in ambiguity relating to truth-conditions. Some sentences in natural languages express more than one claim. Read one way, they express a claim which has one set of truth-conditions. Read another way, they express a different claim with different truth-conditions.

:: Antecedent : The first clause in a conditional is its antecedent. In '(P → Q)', 'P' is the antecedent. In 'If it is raining, then we'll get wet', 'It is raining' is the antecedent. (See 'Conditional' and 'Consequent'.)

:: Argument : An argument is a set of claims (equivalently, statements or propositions) made up from premises and conclusion. An argument can have any number of premises (from 0 to indefinitely many) but has only one conclusion. (Note: This is a somewhat artificially restrictive definition of 'argument', but it will help to keep our discussions sharp and clear.) We can consider *any* set of claims (with one claim picked out as conclusion) as an argument: arguments will include sets of claims that no-one has actually advanced or put forward.

:: Basic sentence : A sentence/sentential clause which lacks internal logical structure (that is, in the context of propositional logic, it is not made up from sentential clauses and sentence connectives).]

:: Cancellable : Conversational implicatures (see entry) are typically cancellable. Where we get a message across by using a sentence and that message isn't part of the sentence-meaning of the sentence, we can typically avoid conveying that message by adding a rider which explicitly rules it out. Attempts to cancel parts of sentence-meaning result in contradiction.

:: Conclusion : The conclusion of an argument is what might be called its 'target claim': it's the claim you're meant to be given a reason to believe by noting the premises.

:: Conditional : The paradigm cases of conditional claims are those like the 'If … then … '-claims in English. Arrow-claims in our formal language are also classed as conditionals. Arrow-claims are called material conditionals, because their truth or falsity is determined by the material facts relating to their antecedent and consequent (that is, simply in terms of the truth-values of antecedent and consequent).

:: Conjunction / conjuncts : Sentences where the main connective is '&' are called conjunctions. (See also 'main connective'.) The term 'conjunction' is also applied to sentences in English with 'and' as the main connective and to related sentences in other natural languages. The clauses plugged into the main connective in a conjunction are called its conjuncts.

:: Consequent : The second clause in a conditional is its consequent. In '(P → Q)', 'Q' is the consequent. In 'If it is raining, then we'll get wet', 'we'll get wet' is the consequent. (See 'Conditional' and 'Antecedent'.)

:: Consistent : A set of claims is consistent if and only if it is possible for all of the claims in the set to be true together. We can test for consistency in formal logic with truth-tables - there is a row on which each of the claims is true.

:: Contingent : A claim is contingent if and only if it is true in some possible circumstances and false in some possible circumstances. We can test for contingency in formal logic with truth-tables - there is a row on which the claim is true and a row on which it is false.

:: Conversational Implicature : A conversational implicature occurs when a speaker gets a message across by using a sentence where the proposition they get across is different from the proposition which is the strict and literal meaning of the sentence they use. ('Implicature' is used only in cases where the message is got across by general and publicly available features of the conversation, rather than requiring specialist knowledge or the setting up of a code.) (See also 'rules of conversation', 'cancellable'.)

:: Counterexample : A counterexample (to the validity of a particular argument) is a situation in which all of the premises are true and the conclusion is false. If we can come up with a counterexample scenario, then we can show that an argument is not valid. We can test for counter-examples in formal logic with truth-tables.

:: Deductively Valid : See entry for 'Valid'.

:: Dictionary : When we look at particular sentences or arguments using our formal language, we define what our basic statement or sentence

letters are going to mean. For example, if we were looking at 'If it's cold and it's cloudy, then it will rain' we might define statement/sentence letters as follows: C: It's cold. O: It's cloudy. R: It will rain.

:: Disjunction / disjuncts : Vel-sentences—that is, sentences which have vel as their main connective—are called disjunctions. (This term is also applied to 'or'-sentences in English and related sentences in other natural languages.) The clauses plugged into the main connective of a disjunction are called its disjuncts.

:: Entails/Entailment : Entailment is a relation that can hold between one claim and another and between a set of claims and one other. A claim or set of claims *entails* a claim C if and only if, where the claim is true or all of the claims in the set are true, C is true too. Some particular claims *entail* C if and only if the argument from those claims to C is valid.

:: Formal language : A formal language is a deliberately constructed language in which expressions are given precise, explicit definitions when they are introduced, and the syntax or grammar of the language is carefully and precisely defined. In formal languages, definition comes before use and determines correct use (rather than use coming first as it typically does with everyday language). The precise, explicit definitions and explicit grammar in a formal language mean that it is settled which sequences of the expressions in the language are grammatical, which sequences of expressions are sentences, and how the meaning of sentences (in particular, what their truth-conditions are) is fixed by how they are made up from expressions. When a formal language is appropriately designed, this means that we can determine what follows from what in the language (on the basis of the structure of the sentences involved). This in turn means that we can use the language to model meanings and arguments in everyday (or 'natural') languages. (See 'Natural language'.) Formal languages are also created for other purposes—e.g. programming languages in computing.

:: Formal logical necessary falsehood : A claim is a formal logical necessary falsehood if and only if it is false in all possible circumstances because of its logical form — for example, any sentence of the form '(P & ~P)'. We can test for this using truth-tables.

:: Formally valid : An argument is formally valid if it is valid because of its logical shape or structure (and in propositional logic this will be a matter of how it is made up from basic sentences and sentence connectives).

:: Grammar (or Syntax) : We're interested in a special sense of 'grammar' when we're setting up a formal language. *A* grammar, in the sense we're interested in, is a set of rules which fix which sequences of

expressions are sentences of the language. When we talk about *a* grammar for a language, we can also use the term 'syntax'.

:: Inconsistent : A set of sentences is inconsistent if and only if it is not possible for all of the sentences in the set to be true together (and note that a single sentence can be inconsistent, if there is no way for it to be true—e.g. 'The box is closed and it is not the case that the box is closed'). We can test for inconsistency in formal logic with truth-tables - there is no row in which all the claims are true.

:: Invalid : Arguments which are not valid are said to be invalid. See entry for 'Valid'.

:: Logically equivalent : Two sentences are logically equivalent if they are true in exactly the same circumstances (and false in exactly the same circumstances).

:: Logical Form : The logical form of a claim is its shape or structure in terms of the kinds of elements we distinguish in creating formal logical languages: the sort of shape or structure which determines how the claim can figure in formally valid arguments. For example, 'It's raining and it's warm' and 'Racism is unjust and gender discrimination is unjust' share a logical form, despite being radically different subject-matter. In terms of the structures of propositional logic, which is our focus in this course, they are both conjunctions and plausibly both have the form '(A & B)'.

:: Main Connective : The main connective in a sentence is the connective at the highest level of structure. When we see a sentence as being built up in stages, starting with basic sentences and working up through progressively more complex sentential clauses, the main connective is the last one to be involved. The type of the main connective defines what kind of sentence the sentence is: sentences with '&' as the main connective are *conjunctions*; sentences with '~' as the main connective are *negations*; sentences with 'v' as the main connective are *disjunctions*; sentences with '→' as the main connective are (*material*) *conditionals*.

:: Material Conditional : Material conditionals are arrow-sentences. They have an antecedent (the sentential clause to the *left* of their main, arrow, connective) and an antecedent (the sentential clause to the *right* of their main, arrow, connective). Material conditionals are false *only* where their antecedent is true and their consequent false; and true in all other circumstances.

:: Mismatch / mismatch case : 'Mismatch case' isn't part of the standard terminology of logic, but we use the term quite a lot in the course, so we've included it here. A mismatch case, as we use the term,

is a case in which a sentence involving a natural-language sentence connective has a different truth-value from the relevant sentence of our formal language, involving the connective we had hoped would have the same truth-table. If we find genuine mismatch cases, this shows there are at least some meanings of the natural-language connective which result in truth-conditions for sentences different from those of the formal-language connective.

:: Natural language : A natural language is an everyday language—like Norwegian, Swahili, Japanese, Urdu, Mandarin, or English. Natural languages are 'wild', 'untamed' languages: the meanings of their words, and the significance of their sentence structures, aren't fixed by precise definitions (dictionaries don't *fix* meanings, they try to capture or represent meanings that are already there); rather, those meanings are somehow determined by how speakers use the words (and perhaps by what goes on in speakers heads). This 'wildness' makes the task of evaluating arguments expressed in natural languages more difficult. That's part of the motivation for developing formal languages as tools to use in looking at arguments. (See 'formal language'.)

:: Necessary (necessary claim) : In logic, we say a claim is necessary if, and only if, it is true in all possible situations. Formal logical necessities are claims which are true on all rows of their truth-table, because of their logical form. (See 'Tautology'.)

:: Negations : Negations are tilde sentences. A negation is true when the plugged-in sentence is false, and false when the plugged-in sentences is true.

:: Occasion-meaning : A meaning got across or conveyed in a particular conversation which is not the sentence-meaning of the sentence used. Also called 'speaker-meaning'.

:: Paraphrase / Logical Paraphrase : In this course we'll mean by 'paraphrase' / 'logical paraphrase' a rephrasing of a sentence which has the same truth-conditions as the original: so it is true in exactly the same circumstances as the original, and false in exactly the same circumstances as the original. Often, in looking at the structure of an argument expressed in natural language, we will want to paraphrase some claims to help to reveal a pattern of repeated sentential clauses which help make up the underlying form of the argument.

:: Pragmatics : An account of what speakers do with sentences which goes beyond their strict and literal, constant-contribution word and sentence meanings.

:: Premise : A premise is a starting claim in an argument. The premises of an argument are supposed to support the conclusion—roughly, provide a reason to believe the conclusion.

:: Proposition : A proposition is what we have called a claim. Particular propositions have specific truth-conditions.

:: Proposition Conveyed : See 'Proposition Expressed'.

:: Proposition Expressed : The *proposition expressed* by an utterance is just the proposition that is the meaning of the sentence used (the sentence-meaning). In some cases, a speaker will get across a message by using a sentence which has a content (a meaning) different from the proposition which is the meaning of the sentence used. This is called the *proposition conveyed* (by that utterance).

:: Propositional logic : The logic of sentential clauses and sentence connectives.

:: Rules of conversation : Philosopher Paul Grice suggested that conversation is a cooperative activity and that speakers participate following (and expecting others to follow) some implicit rules. (The rules are implicit in the sense that most speakers can't spell them out explicitly in words, even though they do seem to follow them in what they do.) Grice suggested that the rules were as follows: *Quantity* — give an amount of information appropriate to the conversation; *Quality* — stick to the truth; *Relevance* — be relevant; *Manner* — keep things orderly. Grice also suggested that when it seems a speaker has broken a rule of conversation this sends hearers on a search for an explanation of why the speaker did this, and why they said what they did, and this leads to conversation implicatures. (See 'conversational implicature'.) One other key point about rules of conversation for our consideration of the meaning of sentence-connectives is that we might think that a sentence is a *bad thing to say* (because it breaks one or more of rules 1, 3, or 4 for no good reason) without it being *false*.

:: Semantics : An account of strict and literal, constant-contribution word and sentence meaning (See also 'pragmatics').

:: Sentence connective : An expression which connects to a specific number of sentences/sentential clauses to form a larger sentence or sentential clause. We look at one-place connectives (e.g. 'It is not the case that … '), which have one sentence plugged into them to make a larger sentence, and two-place connectives (e.g. ' … and … ') which have two sentences plugged into them to make a larger sentence.

:: Sentence-meaning : The meaning that a sentence has which is due to the constant-contribution meanings of its component words. (See 'Occasion meaning'.)

:: Sentential clause : A sequence of expressions within a sentence that could stand as a sentence in its own right (and which functions in that larger sentence in a sentence-like way).

:: Sound (argument) : An argument is sound if, and only if, it is deductively valid *and* all of its premises are true. Obviously, when we're investigating a particular area or subject matter, we're interested in sound arguments. In logic, however, we're focusing on the reasoning, not whether the premises are true or false. Our focus is on validity: on whether, *if* the premises were true, the conclusion would have to be true too.

:: Speaker meaning : See 'Occasion meaning'.

:: Statement : A statement is what is expressed by a particular use of a sentence. Sentences can be ambiguous, in that they can express more than one claim or statement. For example, 'Jo fell at the bank' might be used to say that Jo fell at the financial institution or to say that Jo fell at the side of the river. When we look at particular arguments, we need to spell out clearly which claims or statements we are taking to be involved. (See 'Proposition'.)

:: Structural ambiguity : Structural ambiguity is a form of ambiguity that arises in a phrase or sentence because it can be read or heard as being structured in more than one way. For example, 'That's not helpful or ingenious' can be heard with the 'not' applying to all of 'helpful or ingenious' ('That's neither helpful nor ingenious') or with the 'not' applying only to 'helpful' ('Either that's not helpful or it's ingenious'). Our formal language is designed so none of its sentences are structurally ambiguous. This means it can be used to spell out ambiguities in natural language sentences in a clear and accessible way.

:: Syntax : See 'Grammar'.

:: Tautology : A (formal logical) tautology in logic is a sentence that is true in all possible circumstances because of its logical form. We can test for tautologies in formal logic with truth-tables.

:: Truth-conditions : The truth-conditions of a sentence are the conditions under which it is true.

:: Truth-functional : A sentence connective is truth functional if the truth-value of sentences/sentential clauses made up by using it are always fixed by the truth values of the sentential clauses plugged into it.

:: Truth-table : A truth-table is a table showing how the truth-values of complex sentences depend upon/are determined by the truth-values of their basic sentences/sentential clauses.

:: Truth-value : The truth-value of a sentence is how it stands with regard to truth and falsity. Note that in this course we operate with the assumptions (a) that there are just two truth-values, namely true and false and (b) that every claim has exactly one of those truth-values (i.e. there are no claims which are neither true nor false, nor any which are both true and false).

:: Valid (deductively valid) : An argument is valid if and only if it is not possible for all of its premises to be true and its conclusion false. (It can be helpful to put this in terms of possible situations: An argument is valid if and only if there is no possible situation in which all of its premises are true and its conclusion false.) Arguments which are not valid are said to be invalid.

:: Well-formed formula (wff) : A well-formed formula is a sequence of expressions in a formal language which is grammatical according to the grammatical rules of the language.