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Chapter 1 : Logical consequence - Wikipedia

common concept of logical consequence The deductive-theoretic definition and the with the concept of logical, i.e., formal consequence, and thus with a.

A B as the elimination rules for conjunction. The second pair of rules would often be considered to be just a more complicated variant of the pair of projections. However, from an intensional point of view, these two pairs of rules are not identical. This is not the case in this example. Pursuing this idea leads to principles of harmony and inversion which are different from the the standard ones. As harmony and inversion lie at the heart of proof-theoretic semantics, many of its issues are touched. Taking the topic of intensionality seriously may reshape many fields of proof-theoretic semantics. And since the identity of proofs is a basic topic of categorial proof theory, the latter will need to receive stronger attention in proof-theoretic semantics than is currently the case. Further Reading For negation and denial see Tranchini b ; Wansing For natural language semantics see Francez For classical logic see the entry on classical logic. Conclusion and outlook Standard proof-theoretic semantics has practically exclusively been occupied with logical constants. Logical constants play a central role in reasoning and inference, but are definitely not the exclusive, and perhaps not even the most typical sort of entities that can be defined inferentially. A framework is needed that deals with inferential definitions in a wider sense and covers both logical and extra-logical inferential definitions alike. The idea of definitional reflection with respect to arbitrary definitional rules see 2. Furthermore, the concentration on harmony, inversion principles, definitional reflection and the like is somewhat misleading, as it might suggest that proof-theoretic semantics consists of only that. It should be emphasized that already when it comes to arithmetic, stronger principles are needed in addition to inversion. However, in spite of these limitations, proof-theoretic semantics has already gained very substantial achievements that can compete with more widespread approaches to semantics. An Introduction to Inferentialism, Cambridge Mass.: Di Cosmo, Roberto and Dale Miller An Essay in Proof Theory, D. Thesis, Philosophy Department, Oxford University. Cut Elimination in Categories, Berlin: Kahle and Schroeder-Heister, eds. Piecha and Schroeder-Heister, eds. The Logical Basis of Metaphysics, London: North Holland, , pp. Kahle, Reinhard and Peter Schroeder-Heister, eds. Allen and Unwin, pp. A Structuralist Theory of Logic, Cambridge: Springer; 2nd edition, Intuitionistic Type Theory, Napoli: Dales and Gianluigi Oliveri eds. Negri, Sara and Jan von Plato Structural Proof Theory, Cambridge: Constructive Negations and Paraconsistency, Berlin: Advances in Proof-Theoretic Semantics, Cham: A Proof-Theoretical Study, Stockholm: John Hopkins Press, pp. Auxier and Lewis Edwin Hahn eds. David Pearce and Heinrich Wansing eds. The Cerisy Conference, Mark van Atten, et al. Dutilh Novaes, Catarina and Ole T. Essays in Honour of Stephen Read. Festschrift for Luiz Carlos Pereira. Lectures on the Curry-Howard Isomorphism, Amsterdam: Truth as Eternal, Oxford: The Taming of the True, Oxford: An Anti-Realist Perspective, Milano: Edizioni ETS, ; reprint of Ph.

Chapter 2 : Logic - Wikipedia

Deductive-Theoretic Conceptions of Logical Consequence. According to the deductive-theoretic conception of logical consequence, a sentence X is a logical consequence of a set K of sentences if and only if X is a deductive consequence of K, that is, X is deducible or provable from K. Deductive consequence is clarified in terms of the notion of proof in a correct deductive system.

Modal logic In languages, modality deals with the phenomenon that sub-parts of a sentence may have their semantics modified by special verbs or modal particles. For example, "We go to the games" can be modified to give "We should go to the games", and "We can go to the games" and perhaps "We will go to the games". More abstractly, we might say that modality affects the circumstances in which we take an assertion to be satisfied. Confusing modality is known as the modal fallacy. His work unleashed a torrent of new work on the topic, expanding the kinds of modality treated to include deontic logic and epistemic logic. The seminal work of Arthur Prior applied the same formal language to treat temporal logic and paved the way for the marriage of the two subjects. Saul Kripke discovered contemporaneously with rivals his theory of frame semantics , which revolutionized the formal technology available to modal logicians and gave a new graph-theoretic way of looking at modality that has driven many applications in computational linguistics and computer science , such as dynamic logic. Informal reasoning and dialectic[edit] Main articles: Informal logic and Logic and dialectic The motivation for the study of logic in ancient times was clear: This ancient motivation is still alive, although it no longer takes centre stage in the picture of logic; typically dialectical logic forms the heart of a course in critical thinking , a compulsory course at many universities. Dialectic has been linked to logic since ancient times, but it has not been until recent decades that European and American logicians have attempted to provide mathematical foundations for logic and dialectic by formalising dialectical logic. Dialectical logic is also the name given to the special treatment of dialectic in Hegelian and Marxist thought. There have been pre-formal treatises on argument and dialectic, from authors such as Stephen Toulmin The Uses of Argument , Nicholas Rescher Dialectics , [32] [33] [34] and van Eemeren and Grootendorst Pragma-dialectics. Theories of defeasible reasoning can provide a foundation for the formalisation of dialectical logic and dialectic itself can be formalised as moves in a game, where an advocate for the truth of a proposition and an opponent argue. Such games can provide a formal game semantics for many logics. Argumentation theory is the study and research of informal logic, fallacies, and critical questions as they relate to every day and practical situations. Specific types of dialogue can be analyzed and questioned to reveal premises, conclusions, and fallacies. Argumentation theory is now applied in artificial intelligence and law. Mathematical logic Mathematical logic comprises two distinct areas of research: Mathematical theories were supposed to be logical tautologies , and the programme was to show this by means of a reduction of mathematics to logic. If proof theory and model theory have been the foundation of mathematical logic, they have been but two of the four pillars of the subject. Recursion theory captures the idea of computation in logical and arithmetic terms; its most classical achievements are the undecidability of the Entscheidungsproblem by Alan Turing , and his presentation of the Churchâ€"Turing thesis. Most philosophers assume that the bulk of everyday reasoning can be captured in logic if a method or methods to translate ordinary language into that logic can be found. Philosophical logic is essentially a continuation of the traditional discipline called "logic" before the invention of mathematical logic. Philosophical logic has a much greater concern with the connection between natural language and logic. As a result, philosophical logicians have contributed a great deal to the development of non-standard logics e. Logic and the philosophy of language are closely related. Philosophy of language has to do with the study of how our language engages and interacts with our thinking. Logic has an immediate impact on other areas of study. Studying logic and the relationship between logic and ordinary speech can help a person better structure his own arguments and critique the arguments of others. Many popular arguments are filled with errors because so many people are untrained in logic and unaware of how to formulate an argument correctly.

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Computational logic and Logic in computer science A simple toggling circuit is expressed using a logic gate and a synchronous register. Logic cut to the heart of computer science as it emerged as a discipline: The notion of the general purpose computer that came from this work was of fundamental importance to the designers of the computer machinery in the s. In the s and s, researchers predicted that when human knowledge could be expressed using logic with mathematical notation , it would be possible to create a machine that reasons, or artificial intelligence. This was more difficult than expected because of the complexity of human reasoning. In logic programming , a program consists of a set of axioms and rules. Logic programming systems such as Prolog compute the consequences of the axioms and rules in order to answer a query. Today, logic is extensively applied in the fields of artificial intelligence and computer science , and these fields provide a rich source of problems in formal and informal logic. Argumentation theory is one good example of how logic is being applied to artificial intelligence. Boolean logic as fundamental to computer hardware:

Chapter 3 : Works by Matthew W. McKeon - PhilPapers

(2) The deductive- theoretic characterization of logical consequence: X is a logical consequence of K iff there is a deduction in a correct deductive system of X from K. Following Shapiro (, p. 3) define a logic to be a language L plus either a model-theoretic or a deductive-theoretic account of logical consequence.

Deductive and Inductive Consequence Some arguments are such that the joint truth of the premises is necessarily sufficient for the truth of the conclusions. In inductively valid arguments, the joint truth of the premises is very likely but not necessarily sufficient for the truth of the conclusion. An inductively valid argument is such that, as it is often put, its premises make its conclusion more likely or more reasonable even though the conclusion may well be untrue given the joint truth of the premises. The argument All swans observed so far have been white. Smoothy is a swan. Therefore, Smoothy is white. Smoothy may well be a black swan. Distinctions can be drawn between different inductive arguments. Some inductive arguments seem quite reasonable, and others are less so. There are many different ways to attempt to analyse inductive consequence. We might consider the degree to which the premises make the conclusion more likely a probabilistic reading , or we might check whether the most normal circumstances in which the premises are true render the conclusion true as well. This leads to some kinds of default or non-monotonic inference. The field of inductive consequence is difficult and important, but we shall leave that topic here and focus on deductive validity. See the entries on inductive logic and non-monotonic logic for more information on these topics. The constraint of necessity is not sufficient to settle the notion of deductive validity, for the notion of necessity may also be fleshed out in a number of ways. To say that a conclusion necessarily follows from the premises is to say that the argument is somehow exceptionless, but there are many different ways to make that idea precise. A first stab at the notion might use what we now call metaphysical necessity. Perhaps an argument is valid if it is metaphysically impossible for the premises to be true and the conclusion to be untrue, valid ifâ€”holding fixed the interpretations of premises and conclusionâ€”in every possible world in which the premises hold, so does the conclusion. Many admit the existence of a posteriori necessities, such as the claim that water is H2O. If that claim is necessary, then the argument: Therefore, x is H2O. It was a genuine discovery that water is H2O, one that required significant empirical investigation. While there may be genuine discoveries of valid arguments that we had not previously recognised as such, it is another thing entirely to think that these discoveries require empirical investigation. An alternative line on the requisite sort of necessity turns to conceptual necessity. On this line, the conclusion of 3 is not a consequence of its premise given that it is not a conceptual truth that water is H2O. The concept water and the concept H2O happen to pick out the same property, but this agreement is determined partially by the world. A similar picture of logic takes consequence to be a matter of what is analytically true, and it is not an analytic truth that water is H2O. If metaphysical necessity is too coarse a notion to determine logical consequence since it may be taken to render too many arguments deductively valid , an appeal to conceptual or analytic necessity might seem to be a better route. The trouble, as Quine argued, is that the distinction between analytic and synthetic and similarly, conceptual and non-conceptual truths is not as straightforward as we might have thought in the beginning of the 20th Century. Furthermore many arguments seem to be truth-preserving on the basis of analysis alone: Still, many have thought that 4 is not deductively valid, despite its credentials as truth-preserving on analytic or conceptual grounds. It is not quite as general as it could be because it is not as formal as it could be. The argument succeeds only because of the particular details of family concepts involved. A further possibility for carving out the distinctive notion of necessity grounding logical consequence is the notion of apriority. Deductively valid arguments, whatever they are, can be known to be so without recourse to experience, so they must be knowable a priori. A constraint of apriority certainly seems to rule argument 3 out as deductively valid, and rightly so. However, it will not do to rule out argument 4. If we take arguments like 4 to turn not on matters of deductive validity but something else, such as an a priori knowable definition, then we must look elsewhere for a characterisation of logical consequence. Formal and Material Consequence The strongest and most widespread proposal for finding a narrower criterion for logical consequence is the appeal to formality. What could the distinction between form and content mean? We mean to say that consequence is formal if it depends on the form and not the substance of the claims involved. But how is that to be understood? We will give at most a sketch, which, again, can be filled out in a number of ways. The obvious first step is to notice that all presentations of the rules of logical consequence rely on schemes. Some H is G. Therefore some H is not F. Inference schemes, like the one above, display the structure of valid arguments. Perhaps to say that an argument is formally valid is to say that it falls under some general scheme of which every instance is valid, such as Ferio. That, too, is an incomplete specification of formality. The material argument 4 is an instance of: We must say more to explain why some schemes count as properly formal and hence a sufficient ground for logical consequence and others do not. A general answer will articulate the notion of logical form , which is an important issue in its own right involving the notion of logical constants , among other things. Instead of exploring the details of different candidates for logical form, we will mention different proposals about the point of the exercise. What is the point in demanding that validity be underwritten by a notion of logical form? There are at least three distinct proposals for the required notion of formality, and each provides a different kind of answer to that question. We might take the formal rules of logic to be totally neutral with respect to particular features of objects. Laws of logic, on this view, must abstract away from particular features of objects. Logic is formal in that it is totally general. One way to characterise what counts as a totally general notion is by way of permutations. Tarski proposed that an operation or predicate on a domain counted as general or logical if it was invariant under permutations of objects. A permutation of a collection of objects assigns for each object a unique object in that collection, such that no object is assigned more than once. A 2-place predicate R is invariant under permutation if for any permutation p, whenever Rxy holds, Rp x p y holds too. We may have permutations p such that even though x is the mother of y, p x is not the mother of p y. We may use permutation to characterise logicality for more than predicates too: Defining this rigorously requires establishing how permutations operate on sentences, and this takes us beyond the scope of this article. A closely related analysis for formality is that formal rules are totally abstract. They abstract away from the semantic content of thoughts or claims, to leave only semantic structure. On this view, expressions such as propositional connectives and quantifiers do not add new semantic content to expressions, but instead add only ways to combine and structure semantic content. Another way to draw the distinction or to perhaps to draw a different distinction is to take the formal rules of logic to be constitutitive norms for thought, regardless of its subject matter. It is plausible to hold that no matter what we think about, it makes sense to conjoin, disjoin and negate our thoughts to make new thoughts. It might also make sense to quantify. The behaviour, then, of logical vocabulary may be used to structure and regulate any kind of theory, and the norms governing logical vocabulary apply totally universally. The norms of valid argument, on this picture, are those norms that apply to thought irrespective of the particular content of that thought. MacFarlane distinguished the three kinds of formality at which we have merely waved here, and he provides a detailed discussion of the notions, making many distinctions over which we have passed. Proofs and Models Twentieth Century technical work on the notion of logical consequence has centered on two different techniques, one explaining the notion in terms of proofs and the other via models. On the proof-centered approach to logical consequence, the validity of an argument amounts to there being a proof of the conclusions from the premises. Exactly what proofs are is a big issue but the idea is fairly plain at least if you have been exposed to some proof system or other. Proofs are made up of small steps, the primitive inference principles of the proof system. The 20th Century has seen very many different kinds of proof system, from so-called Hilbert proofs, with simple rules and complex axioms, to natural deduction systems, with few or even no axioms and very many rules. In natural deduction proofs, the rules are plausibly thought to somehow constitute or display the meaning of the connectives. The model-centered approach to logical consequence takes the validity of an argument to be absence of counterexample. A counterexample to an argument is, in general, some way of manifesting the manner in which the premises of the argument fail to lead to a conclusion. One way to do this is to provide an argument of the same form for which the premises are clearly true and the conclusion is clearly false. Another way to do this is to provide a circumstance in which the premises are true and the conclusion is false. In the contemporary literature the intuitive idea of a counterexample is developed into a theory of models. Models are abstract mathematical structures that provide possible interpretations for each of the non-logical primitives in a formal language. Given a model for a language one is able to define what it is for a sentence in that language to be true according to that model or not. So, the intuitive idea of logical consequence in terms of counterexamples is then formally rendered as follows: Put in positive terms: Here, the behavior of the logical vocabulary is explained by their recursive truth or satisfaction conditions relative to a model. A conjunction, for example, is true in a model if and only if both conjuncts are true in that model. Or, on the Tarskian account of satisfaction, if and only if the open sentence Fx is satisfied by every object in the domain of the model. The distinctive logical vocabulary is purely formal, on this picture, because no matter what we say about the semantics of the non-logical parts of the vocabulary, we can determine the truth or satisfaction of complex formulas involving conjunction, quantifiers, etc. Just as one can ask after the philosophical import of proof systems, so too one can and philosophers often do ask about the philosophical import of the model-centered approach. How are we to understand variation of truth-values across models? On one account, models simply model different possible worlds and so, logical consequence defined by those models is a model of necessary truth preservation. On the other, models provide different interpretations of the non-logical vocabulary of our language and so, logical consequence is not necessary truth preservation, but rather, truth preservation on the basis of the meanings of the logical vocabulary. Once you have two different analyses of a relation of logical consequence, one can ask about what general features such a relation has independently of its analysis as proof-theoretic or model-theoretic. One way of answering this question goes back to Tarski , who introduced the notion of consequence operations.

Chapter 4 : Logical Consequence | Internet Encyclopedia of Philosophy

1. Deductive and Inductive Consequence. Some arguments are such that the (joint) truth of the premises is necessarily sufficient for the truth of the conclusions. In the sense of logical consequence central to the current tradition, such "necessary sufficiency" distinguishes deductive validity from inductive validity.

References and Further Reading 1. Introduction For a given language, a sentence is said to be a logical consequence of a set of sentences, if and only if, in virtue of logic alone, the sentence must be true if every sentence in the set were to be true. This corresponds to the ordinary notion of a sentence "logically following" from others. Logicians have attempted to make the ordinary concept more precise relative to a given language L by sketching a deductive system for L, or by formalizing the intended semantics for L. Any adequate precise characterization of logical consequence must reflect its salient features such as those highlighted by Alfred Tarski: For more comprehensive presentations of the two definitions of logical consequence, as well as further critical discussion, see the entries Logical Consequence, Model-Theoretic Conceptions and Logical Consequence, Deductive-Theoretic Conceptions. The Concept of Logical Consequence a. The concept of logical consequence is one of those whose introduction into a field of strict formal investigation was not a matter of arbitrary decision on the part of this or that investigator; in defining this concept efforts were made to adhere to the common usage of the language of everyday life. But these efforts have been confronted with the difficulties which usually present themselves in such cases. With respect to the clarity of its content the common concept of consequence is in no way superior to other concepts of everyday language. Its extension is not sharply bounded and its usage fluctuates. Any attempt to bring into harmony all possible vague, sometimes contradictory, tendencies which are connected with the use of this concept, is certainly doomed to failure. We must reconcile ourselves from the start to the fact that every precise definition of this concept will show arbitrary features to a greater or less degree. Nevertheless, despite its vagueness, Tarski believes that there are identifiable, essential features of the common concept of logical consequence. From an intuitive standpoint, it can never happen that both the class K consists of only true sentences and the sentence X is false. Moreover, since we are concerned here with the concept of logical, that is, formal consequence, and thus with a relation which is to be uniquely determined by the form of the sentences between which it holds, this relation cannot be influenced in any way by empirical knowledge, and in particular by knowledge of the objects to which the sentence X or the sentences of class K refer. The consequence relation cannot be affected by replacing designations of the objects referred to in these sentences by the designations of any other objects. I now elaborate on 1 - 3 in order to shape two preliminary characterizations of logical consequence. The Logical Consequence Relation Has a Modal Element Tarski countenances an implicit modal notion in the common concept of logical consequence. If X is a logical consequence of K, then not only is it the case that not all of the elements of K are true and X is false, but also this is necessarily the case. That is, X follows from K only if it is not possible for all of the sentences in K to be true with X false. For example, the supposition that All West High School students are football fans and that Kelly is not a West High School student does not rule out the possibility that Kelly is a football fan. We said above that Kelly is not both at home and at work and Kelly is at home jointly imply Kelly is not at work. But it is hard to see what this comes to without further clarification of the relevant notion of possibility. For example, consider the following pairs of sentences. Kelly kissed her sister at 2: Kelly is a female. Kelly is not the US President. Ten is a prime number. Ten is greater than nine. For each pair of sentences, there is a sense in which it is not possible for the first to be true and the second false. At the very least an account of logical consequence must distinguish logical possibility from other types of possibility. Should truths about physical laws, US political history, zoology, and mathematics constrain what we take to be possible in determining whether or not the first sentence of each pair could logically be true with the second sentence false? If not, then this seems to mystify logical possibility e. To paraphrase questions asked by G. Or should I ignore my present state of knowledge in considering what is logically possible? Tarski does not derive a clear notion of logical possibility from the common concept of logical consequence. Perhaps there is none to be had, and we should seek the help of a proper theoretical development in clarifying the notion of logical possibility. The Logical Consequence Relation is Formal Tarski observes that logical consequence is a formal consequence relation. And he tells us that a formal consequence relation is a consequence relation that is uniquely determined by the form of the sentences between which it holds. Consider the following pair of sentences 1 Some children are both lawyers and peacemakers. It appears that this fact does not turn on the subject matter of the sentences. For example, 3 is false and 4 is true. One might think that 4 does not follow from 3 because being a prime number does not necessitate being greater than nine. However, this does not require one to think that ten could be a prime number and less than or equal to nine, which is probably a good thing since it is hard to see how this is possible. Note that the claim here is not that formality is sufficient for a consequence relation to qualify as logical but only that it is a necessary condition. I now elaborate on this last point by saying a little more about forms of sentences that is, sentential forms and formal consequence. Distinguishing between a term of a sentence replaced with a variable and one held constant determines a form of the sentence. No children are both lawyers and peacemakers Many children are both lawyers and peacemakers Few children are both lawyers and peacemakers Whether X is a formal consequence of K then turns on a prior selection of terms as constant and others replaced with variables. Relative to such a determination, X is a formal consequence of K if and only if iff there is no interpretation of the variables according to which each of the K are true and X is false. Consider the following pair. This is not, however, sufficient reason for seeing 6 as a logical consequence of 5. There are two ways of thinking about why, a metaphysical consideration and an epistemological one. First the metaphysical consideration. It seems possible for 5 to be true and 6 false. The course of U. Also, it seems possible that in the future there will be a female US President. In order for a formal consequence relation from K to X to qualify as logical it has to be the case that it is necessary that there is no interpretation of the variables in K and X according to which the K-sentences are true and X is false. The epistemological consideration is that one might think that knowledge that X follows logically from K should not essentially depend on being justified by experience of extra-linguistic states of affairs. Clearly, the determination that 6 follows formally from 5 essentially turns on empirical knowledge, specifically knowledge about the current political situation in the US. The Logical Consequence Relation is A Priori Tarski says that by virtue of being formal, knowledge that X follows logically from K cannot be affected by knowledge of the objects that X and the sentences of K are about. Hence, our knowledge that X is a logical consequence of K cannot be influenced by empirical knowledge. However, as noted above, formality by itself does not insure that the extension of a consequence relation is not influenced by empirical knowledge. We characterize empirical knowledge in two steps as follows. First, a priori knowledge is knowledge "whose truth, given an understanding of the terms involved, is ascertainable by a procedure which makes no reference to experience" Hamlyn , p. Empirical, or a posteriori, knowledge is knowledge that is not a priori, that is, knowledge whose validation necessitates a procedure that does make reference to experience. We can safely read Tarski as saying that a consequence relation is logical only if knowledge that something falls in its extension is a priori, that is, only if the relation is a priori. We began by asking, for a given language L, what conditions must be met in order for a sentence X of L to be a logical consequence of a class K of L-sentences? Tarski thinks that an adequate response must reflect the common concept of logical consequence, that is, the concept as it is ordinarily employed. By the lights of this concept, an adequate account of logical consequence must reflect the formality and necessity of logical consequence, and must also reflect the fact that knowledge of what follows logically from what is a priori. Tying the criteria together, in order to fix what follows logically from what in a given language L, we must select a class of constants that determines a formal consequence relation that is both necessary and known, if at all, a priori. Such constants are called logical constants, and we say that the logical form of a sentence is a function of the logical constants that occur in the sentence and the pattern of the remaining expressions. As was illustrated above, the notion of formality does not presuppose a criterion of logical constancy. A consequence relation based on any division between constants and terms replaced with variables will automatically be formal with respect to the latter. Of course, we have yet to spell out the modal notion in the concept of logical consequence. Tarski pretty much left this underdeveloped in his Lacking such an explanation hampers our ability to clarify the rationale for a selection of terms to serve as the logical ones. Traditionally, logicians have regarded sentential connectives such as and, not, or, if Remarking on the boundary between logical and non-terms, Tarski , p. Underlying this characterization of logical consequence is the division of all terms of the language discussed into logical and extra-logical. This division is not quite arbitrary. If, for example, we were to include among the extra-logical signs the implication sign, or the universal quantifier, then our definition of the concept of consequence would lead to results which obviously contradict ordinary usage. On the other hand, no objective grounds are known to me which permit us to draw a sharp boundary between the two groups of terms. It seems to be possible to include among logical terms some which are usually regarded by logicians as extra-logical without running into consequences which stands in sharp contrast to ordinary usage. Tarski seems right to think that the logical consequence relation turns on the work that the logical terminology does in the relevant sentences. It seems odd to say that Kelly is happy does not logically follow from All are happy because the second is true and the first false when All is replaced with Few. Also, it seems plausible to say that I know a priori that there is no possible interpretation of Kelly and is mortal according to which it is necessary that Kelly is mortal is true and Kelly is mortal is false. This makes Kelly is mortal a logical consequence of it is necessary that Kelly is mortal. Tarski says that future research will either justify the traditional boundary between the logical and the non-logical or conclude that there is no such boundary and the concept of logical consequence is a relative concept whose extension is always relative to some selection of terms as logical p. How, exactly, does the terminology usually regarded by logicians as logical work in making it the case that one sentence follows from others? In the next two sections two distinct approaches to understanding the nature of logical terms are sketched. Each approach leads to a unique way of characterizing logical consequence and thus yields a unique response to the above question. The locked room metaphor Suppose that you are locked in a dark windowless room and you know everything about your language but nothing about the world outside. A sentence X and a class K of sentences are presented to you. If you can determine that X is true if all the sentences in K are, X is a logical consequence of K. So, I know, a priori, if P and Q is true, then Q is true. Taking not and and to be the only logical constants in 9 Kelly is not both at home and at work, 10 Kelly is at home, and 11 Kelly is not at work, we formalize the sentences as follows, letting k mean Kelly, H mean is at home, and W mean is at work. The reason why turns on the semantic properties of and and not, which are knowable a priori. If we identify the meanings of the predicates with their extensions in all possible worlds, then the supposition that there is a female U.

Chapter 5 : Logical Consequence (Stanford Encyclopedia of Philosophy)

Logical consequence (also entailment) is a fundamental concept in logic, which describes the relationship between statements that hold true when one statement logically follows from one or more statements.

Proofs in N are objects of finite length; a deduction is a finite sequence of sentences. Let all numerals name Beth. Note that the sentences in S only say that P holds for 0, 1, 2, and so on, and not also that 0,1, 2, etc. The above interpretation takes advantage of this fact by reinterpreting all numerals as names for Beth. We can add to S the functional equivalent of the claim that 1, 2, 3, etc. Compactness is not a salient feature of logical consequence conceived deductive theoretically. This suggests, by the third criterion of a successful theoretical definition of logical consequence mentioned in Logical Consequence, Philosophical Considerations , that no compact consequence relation is definitive of the intuitive notion of deducibility. Nevertheless, as Tarski argues, the fact that there cannot be deduction-system accounts of some intuitively correct principles of inference is reason for taking a model-theoretic characterization of logical consequence to be more fundamental than any characterization in terms of a deductive system sound and complete with respect to the model-theoretic characterization. Is deductive system N correct? In discussing the status of the characterization of logical consequence in terms of deductive system N, we assumed that N is correct. The question arises whether N is, indeed, correct. The biconditional holds only if both 1 and 2 are true. So N is incorrect if either 1 or 2 is false. The truth of 1 and 2 is relevant to the correctness of the characterization of logical consequence in terms of system N, because any adequate deductive-theoretic characterization of logical consequence must identify the logical terms of the relevant language and account for their inferential properties for discussion, see Logical Consequence, Philosophical Considerations: Are there such deductions? In order to fine-tune the question note that the sentential connectives, the identity symbol, and the quantifiers of M are intended to correspond to or, and, not, if Hence, N is a correct deductive system only if the Intro and Elim rules of N reflect the inferential properties of the ordinary language expressions. In what follows, we sketch three views that are critical of the correctness of system N because they reject 2. We derive 4 not-P from 1. The proof seems to be composed of valid modes of inference. Here we follow the relevance logicians Anderson and Belnap , pp. In a nutshell, Anderson and Belnap claim that the proof is defective because it commits a fallacy of equivocation. The move from 2 to 3 is correct only if or has the sense of at least one. For example, from Kelly is female it is legit to infer that at least one of the two sentences Kelly is female and Kelly is older than Paige is true. On this sense of or given that Kelly is female, one may infer that Kelly is female or whatever you like. However, in order for the passage from 3 and 4 to 5 to be legitimate the sense of or in 3 is if not Two things to highlight. First, Anderson and Belnap think that the inference from 2 to 3 on the if not Given that Kelly is female it is problematic to deduce that if she is not then Kelly is older than Paigeâ€”or whatever you like. Such an inference commits a fallacy of relevance for Kelly not being female is not relevant to her being older than Paige. Second, the principle of inference underlying the move from 3 and 4 to 5 â€”from P or Q and not-P to infer Qâ€—is called the principle of the disjunctive syllogism. If Q is relevant to P, then the principle holds on this reading of or. It is worthwhile to note the essentially informal nature of the debate. It calls upon our pre-theoretic intuitions about correct inference. No doubt, pre-theoretical notions and original intuitions must be refined and shaped somewhat by theory. Our pre-theoretic notion of correct deductive reasoning in ordinary language is not completely determinant and precise independently of the resources of a full or partial logic. See Shapiro , chaps. Anderson and Belnap , p. The possibility that intuitions in support of the general validity of the principle of the disjunctive syllogism have been shaped by a bad theory of inference is motive enough to consider argumentative support for the principle and to investigate deductive systems for relevance logic. A natural deductive system for relevance logic has the means for tracking the relevance quotient of the steps used in a proof and allows the application of an introduction rule in the step from A to B "only when A is relevant to B in the sense that A is used in arriving at B" Anderson and

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Belnap , p. Consider the following proof in system N.

Chapter 6 : Alfred Tarski - Wikipedia

He covers the concepts of logical consequences, set-theoretic and linguistic preliminaries, model-theoretic consequence, and deductive consequence. More detailed discussions include Tarski's characterization of the common concept of logical consequences, the syntax of M., the metaphysics of domains, and deductive system N.

The Concept of Logical Consequence: An Introduction to Philosophical Logic th Vol. According to Tarski, the relation lies in the concept of satisfaction. Nevertheless, the above relation can only be fulfilled at the level of necessary and formal consequences. Necessary and formal consequences are the key to understanding the concept of logical consequence. Unfortunately, McKeon does not specifically explain both these terms. This strategy clearly violates the basic principles of the concept of logical consequence oriented towards formal consequences. The question arises, how to determine statements which satisfy the conditions of necessary? Considering McKeon does not definitively explain the problem of necessary, I will refer to G. Sher explains that in order to determine the conditions of necessary, a formal condition, or the nature of formal, or formally necessary is required. The formal nature of the concept of logical consequence is reflected in i the choice of logical terms, and II the construction of models. Here are the succinct explanations. If a non-logical language terminology can only be definitive in the framework of the model, then a strict logical model can be expressed by the relation functions. X is the logical consequence of K, denoted f K R f X , in which the function f based on the logical schema selects what the sentences X and theory K say about the object. On the other hand, the R stands for the formal general relation. The material consequences do not reflect the logical necessity. To that end, how to resolve the weaknesses of the first adequacy condition of the logical model through schemes of non-logical language terminology? This issue is always attributed to the criterion of a prioricity, or an a priori logical consequence proved in a priori way. Consequently, when we reject the building of the epistemology of a prioricity, relation FAC claims to describe the intuitive notion will again stuck in the ontological grounding. He retains the concept of necessary consequences and formal consequences as an adequate basis to proof the intuitive notion. He then concludes that the FAC actually does not contain contradictions. Different solutions come from McKeon. First of all, Mckeon receives a knowledge only based on the characteristics of empirical knowledge. From the empirical, he grounds his epistemic building in two steps as follows: Vice versa, secondly, the a posteriori knowledge should require the direct validity of empirical experience. The empirical division McKeon made, a priori and a posteriori, basically remains on the empirical thesis. So, in the case we are allowed to reject a prioricity criteria, and only recognize the characteristics of the a posteriori one, do not we cancel the status of satisfaction itself? If not, what is the consequence of necessary which may be maintained in the status of satisfaction providing that it does not rely on the formal consequences? Can necessary consequences guarantee logical consequence? Could it reconsider its relation to the substitutional definition? Or is it re-definition present form of the proof-theoretic definition? How to treat a logical model if individual identities do not have a formal structure, even the formal identity of the object? The questions can be expanded further to the rules of deductive system, the structure of U, M domain, neutral topic, individual constant, constant logical, ZFC, function objects, relationships, and so on. In short, McKeon, in his book, gives us a brief summaries as regards the basis for the concept related to the implementation of logical consequence although some caveats need to be added. That is to say, at least, we can keep track down the standard process of logical consequence. It means, supposedly, there is a relation between logical and extra-logical in the neutral topic. Since the topic neutral play a significant role in the language as the vaguest devices, then its task is to provide definitive clues. The definitive requirement is needed to be justified to the logical sentential form, and then rigidly arranged to be logical constants. With this in mind, we might obtain a model in the form of a logical scheme, i. Because if a sentence through non-logical language terminology can explain the object variable, then the interpretation of the truth value is depicted in the model structure of the sentence. Therefore, the ability of a structure to load the value of truth is the basis for clarifying how a sentence can accept this form of truth-value s. Hitchcock , History and Philosophy of Logic 23, Formalized language must meet the logical standard, as the standard of modern logic which recognizes when X is the logical consequence of the class K, then it is not possible to interpret the language of the non-logical terminology that sentence is true and X K wrong. Consistency is needed that, X is the logical consequence of K if and only if X is able to be deduced from K. This debate was triggered because of differences in strategy or scheme to find a logical structure, namely the relationship between language as a logical schema and the actual world as non-logical language terminology. Two major schemes can be mentioned here, the first metaphysical conception including the study of representational and inflationary, and the second conception of linguistics including the study of interpretational and deflationary. Tarski then considers the substitutional definition of logical consequence, but in fact the definition of substitution is not sufficient.

Chapter 7 : Search results for `Logic Terminology` - PhilPapers

Introduction -- The concept of logical consequence -- Tarski's characterization of the common concept of logical consequence -- The logical consequence relation has a modal element -- The logical consequence relation is formal -- The logical consequence relation is A priori -- Logical and non-logical terminology -- The meanings of logical terms.

Alfred did so even though he was an avowed atheist. Because these positions were poorly paid, Tarski also taught mathematics at a Warsaw secondary school; [12] before World War II, it was not uncommon for European intellectuals of research caliber to teach high school. Hence between and his departure for the United States in , Tarski not only wrote several textbooks and many papers, a number of them ground-breaking, but also did so while supporting himself primarily by teaching high-school mathematics. She had worked as a courier for the army in the Polishâ€"Soviet War. They had two children; a son Jan who became a physicist, and a daughter Ina who married the mathematician Andrzej Ehrenfeucht. From Vienna he traveled to Paris to present his ideas on truth at the first meeting of the Unity of Science movement, an outgrowth of the Vienna Circle. Oblivious to the Nazi threat, he left his wife and children in Warsaw. He did not see them again until During the war, nearly all his Jewish extended family were murdered at the hands of the German occupying authorities. Once in the United States, Tarski held a number of temporary teaching and research positions: In , Tarski joined the Mathematics Department at the University of California, Berkeley , where he spent the rest of his career. Tarski became an American citizen in His seminars at Berkeley quickly became famous in the world of mathematical logic. His students, many of whom became distinguished mathematicians, noted the awesome energy with which he would coax and cajole their best work out of them, always demanding the highest standards of clarity and precision. He preferred his research to be collaborative â€" sometimes working all night with a colleague â€" and was very fastidious about priority. Some students were frightened away, but a circle of disciples remained, many of whom became world-renowned leaders in the field. His collected papers run to about 2, pages, most of them on mathematics, not logic. In , he and Stefan Banach proved that, if one accepts the Axiom of Choice , a ball can be cut into a finite number of pieces, and then reassembled into a ball of larger size, or alternatively it can be reassembled into two balls whose sizes each equal that of the original one. This result is now called the Banachâ€"Tarski paradox. In A decision method for elementary algebra and geometry, Tarski showed, by the method of quantifier elimination , that the first-order theory of the real numbers under addition and multiplication is decidable. While this result appeared only in , it dates back to and was mentioned in Tarski This is a very curious result, because Alonzo Church proved in that Peano arithmetic the theory of natural numbers is not decidable. In his Undecidable theories, Tarski et al. The theory of Abelian groups is decidable, but that of non-Abelian groups is not. In the s and 30s, Tarski often taught high school geometry. In , he proved this theory decidable because it can be mapped into another theory he had already proved decidable, namely his first-order theory of the real numbers. In he showed that much of Euclidean solid geometry could be recast as a first-order theory whose individuals are spheres a primitive notion , a single primitive binary relation "is contained in", and two axioms that, among other things, imply that containment partially orders the spheres. Near the end of his life, Tarski wrote a very long letter, published as Tarski and Givant , summarizing his work on geometry. Cardinal Algebras studied algebras whose models include the arithmetic of cardinal numbers. Ordinal Algebras sets out an algebra for the additive theory of order types. Cardinal, but not ordinal, addition commutes. In , Tarski published an important paper on binary relations , which began the work on relation algebra and its metamathematics that occupied Tarski and his students for much of the balance of his life. While that exploration and the closely related work of Roger Lyndon uncovered some important limitations of relation algebra, Tarski also showed Tarski and Givant that relation algebra can express most axiomatic set theory and Peano arithmetic. For an introduction to relation algebra , see Maddux In the late s, Tarski and his students devised cylindric algebras , which are to first-order logic what the two-element Boolean algebra is to classical sentential logic. This work culminated in the two monographs by Tarski, Henkin, and Monk , Tarski produced axioms for logical consequence, and worked on deductive systems , the algebra of logic, and the theory of definability. Not only can its concepts and results be mathematized, but they actually can be integrated into mathematics. Tarski destroyed the borderline between metamathematics and mathematics. He objected to restricting the role of metamathematics to the foundations of mathematics. In , he published a paper presenting clearly his views on the nature and purpose of the deductive method, and the role of logic in scientific studies. His high school and undergraduate teaching on logic and axiomatics culminated in a classic short text, published first in Polish, then in German translation, and finally in a English translation as Introduction to Logic and to the Methodology of Deductive Sciences. Truth in formalized languages[edit] Main article: The German translation was titled "Der Wahrheitsbegriff in den formalisierten Sprachen", "The concept of truth in formalized languages", sometimes shortened to "Wahrheitsbegriff". An English translation appeared in the first edition of the volume Logic, Semantics, Metamathematics. This collection of papers from to is an event in 20th-century analytic philosophy , a contribution to symbolic logic , semantics , and the philosophy of language. For a brief discussion of its content, see Convention T and also T-schema. That condition requires that the truth theory have the following as theorems for all sentences p of the language for which truth is being defined: Logical consequence[edit] In , Tarski published Polish and German versions of a lecture he had given the preceding year at the International Congress of Scientific Philosophy in Paris. A new English translation of this paper, Tarski , highlights the many differences between the German and Polish versions of the paper, and corrects a number of mistranslations in Tarski This publication set out the modern model-theoretic definition of semantic logical consequence, or at least the basis for it. This question is a matter of some debate in the current philosophical literature. This is the published version of a talk that he gave originally in in London and later in in Buffalo ; it was edited without his direct involvement by John Corcoran. It became the most cited paper in the journal History and Philosophy of Logic. The suggested criteria were derived from the Erlangen programme of the German 19th century Mathematician, Felix Klein. Mautner, in , and possibly an article by the Portuguese mathematician Sebastiao e Silva, anticipated Tarski in applying the Erlangen Program to logic. That program classified the various types of geometry Euclidean geometry , affine geometry , topology , etc. A one-to-one transformation is a functional map of the space onto itself so that every point of the space is associated with or mapped to one other point of the space. So, "rotate 30 degrees" and "magnify by a factor of 2" are intuitive descriptions of simple uniform one-one transformations. Continuous transformations give rise to the objects of topology, similarity transformations to those of Euclidean geometry, and so on. As the range of permissible transformations becomes broader, the range of objects one is able to distinguish as preserved by the application of the transformations becomes narrower. Similarity transformations are fairly narrow they preserve the relative distance between points and thus allow us to distinguish relatively many things e. Continuous transformations which can intuitively be thought of as transformations which allow non-uniform stretching, compression, bending, and twisting, but no ripping or glueing allow us to distinguish a polygon from an annulus ring with a hole in the centre , but do not allow us to distinguish two polygons from each other. By domain is meant the universe of discourse of a model for the semantic theory of a logic. If one identifies the truth value True with the domain set and the truth-value False with the empty set, then the following operations are counted as logical under the proposal: All truth-functions are admitted by the proposal. This includes, but is not limited to, all n-ary truth-functions for finite n. It also admits of truth-functions with any infinite number of places. No individuals, provided the domain has at least two members. Tarski explicitly discusses only monadic quantifiers and points out that all such numerical quantifiers are admitted under his proposal. These include the standard universal and existential quantifiers as well as numerical quantifiers such as "Exactly four", "Finitely many", "Uncountably many", and "Between four and 9 million", for example. While Tarski does not enter into the issue, it is also clear that polyadic quantifiers are admitted under the proposal. Relations such as inclusion , intersection and union applied to subsets of the domain are logical in the present sense. Tarski ended his lecture with a discussion of whether the set membership relation counted as logical in his sense. Given the reduction of most of mathematics to set theory, this was, in effect, the question of whether most or all of mathematics is a part of logic. He pointed out that set membership is logical if set theory is developed along the lines of type theory , but is extralogical if set theory is set out axiomatically, as in the canonical Zermeloâ€"Fraenkel set theory. Logical notions of higher order: While Tarski confined his discussion to operations of first-order logic, there is nothing about his proposal that necessarily restricts it to first-order logic. Tarski likely restricted his attention to first-order notions as the talk was given to a non-technical audience. So, higher-order quantifiers and predicates are admitted as well. The present proposal is also employed in Tarski and Givant Feferman raises problems for the proposal and suggests a cure: In particular, it ends up counting as logical only those operators of standard first-order logic without identity. Works[edit] Anthologies and collections The Collected Papers of Alfred Tarski, 4 vols. Journal of Symbolic Logic. Papers from to by Alfred Tarski, Corcoran, J. Original publications of Tarski Une contribution a la theorie de la mesure. Fund Math 15 , A decision method for elementary algebra and geometry. Review with Steven Givant. History and Philosophy of Logic

Chapter 8 : Logical Consequence, Deductive-Theoretic Conceptions of | Internet Encyclopedia of Philosop

The Concept of Logical Consequence is a critical evaluation of the model-theoretic and proof-theoretic characterizations of logical consequence that proceeds from Alfred Tarski's characterization of the informal concept of logical consequence.

Chapter 9 : Edwards : Reduction and Tarski's Definition of Logical Consequence

Tarski's model-theoretic concept of logical consequence formulated in his famous no-countermodels definition corresponds to the latter. Both are found to be indispensable for understanding the rationale of the deductive method and each complements the other.