Towards a logic of questions and answers

1 Introduction

In this paper I will give an outline of a logic designed to handle questions and answers. To understand this paper one needs to have a firm understanding of both standard propositional logic and standard first order predicate logic with identity.

The structure of the paper is this: First, I discuss some preliminary things relevant to the system(s) proposed in the paper. Then I introduce two systems, the first simpler than the second; the first based on propositional logic and the second based on predicate logic. Then I discuss various extensions and interesting features of these systems. Lastly, I discuss the applications of the systems proposed with some practical examples of famous philosophical questions.

2 Motivations

The idea is being able to answer the questions below with theoretical backing:

- Under which conditions is a question answered correctly?
- How should we analyze questions?
- How do we to make sense of utterances such as “but this questions assumes that ...”?

3 Some preliminary remarks about questions and language

How might we usefully (for present purposes) categorize questions into kinds? I think one can do that by considering which kind of answer to the question it is meaningful to give. Some questions are meaningfully answerable with “Yes” & “No” while others are not. Some questions are meaningfully answerable with pronoun answers like “Me”, “I am”, “He is”, and noun answers like “Lars”, “Peter”, “Jens” while others are not. Lastly, all[I] questions are 'answerable' with utterances such as “I don't know”. I will discuss that kind of response in section 7.

Based on the remarks above, it seems to me that there are two kinds of questions:

I Perhaps not entirely all, but very close to this and definitely all questions that appear in non-philosophical, non-linguistic context.

- Yes/no questions (hence “Y/N-questions”) - questions that can be meaningfully answered with “yes” and with “no”.

  “Is it raining?” - “Yes”

- Identifier questions (hence “I-questions”) - questions that can be meaningfully answered with the name of something.[II]

  “Who is the current prosident of the US?” - “Barrack Obama” (As of writing in Jan. 2012.)

As it so happens, these two categories correspond to propositional logic and predicate logic, respectively. Often, with regard to Y/N-questions the analysis/formalization is 'deep' enough for one's purposes at the propositional logic level.[III]

There is a complication with I-questions, which is when there in the question is listed a number of answers, e.g. *“Is your husband at home, work or somewhere else?”*. I will discuss such questions in section 9.

4 The system for Y/N-questions

For the sake of clarity and as a memory-refresher, I list the complete system below.

Constants and variables:

A, ..., Z except Y, N	Propositional constants

Logical operators:

$\neg, \wedge, \vee, \rightarrow, \leftrightarrow$	Negation, conjunction, disjunction, material implication, material equivalence

Other symbols:

(,)	Parentheses. Used to avoid having to rely on order of operations

Question logic symbols:

?	Question indication
Y, N	Answers: affirmative and negative, respectively

As it can be seen, compared with standard propositional logic, there is only one difference in

II There is a complication here, it is discussed later.

III See Swartz and Bradley (1979:183)

symbols used, which is the use of "?" and the alternative use of "Y" and "N".

Some preliminary remarks about kinds of WFFs

It is necessary to introduce some extra jargon which is not necessary for standard propositional logic. In standard propositional logic, there is only one kind of WFFs and grammar for those WFFs. But in my system (technically, a collection of systems) for dealing with questions and answers, it is necessary to introduce different kinds of WFFs:

1. NWFFs - Normal Well-Formed Formulas
2. QAWFFs - Question/Answer Well-Formed Formulas
    1. QWFFs - Question Well-Formed Formulas
    2. AWFFs - Answer Well-Formed Formulas

Each fundamental level above has its own grammar. These are given below.

Grammar for NWFFs

This is the grammar for standard propositional logic (similar to Priest (2001:4)). NWFFs are those that can be made from the rules below using recursion. Examples are given under each rule in italic text.

1. Any propositional constant alone is a NWFF.

    "A"

2. If "α" is a NWFF, then so is "¬α".

    "¬A"

3. If "α" and "β" are NWFFs, then so is "α∧β". The same applies for the symbols: "∨", "→", "↔".

    "A∧B", "A∨B", "A→B", "A↔B"

4. If "α" is a NWFF, then so is "(α)".

    "(A)"

This grammar sometimes results in ambiguous WFFs (e.g. "A→B→C"). I prefer to use parentheses to avoid ambiguity rather than order of operations (i.e. use either "(A→B)→C" or "A→(B→C)"). This is not an important part of the system, and others can use a rule for order of operations or mandatory parentheses.

Grammar for QAWFFs

Grammar for QWFFs

1. If "α" is a NWFF, then is "(α)?" is a QWFF and no longer a NWFF.

   "(A)?"

This makes it the case that all QWFFs has precisely one "?" symbol.

Grammar for AWFFs

1. "Y" and "N" are AWFFs

That means that there are precisely two AWFFs.

Scope of logical operators

The scope of the normal connectives are the normal scopes.

Monadic. The operand for negation (¬) operates on whatever is to the *right* of it using the smallest scope possible. The operand for question indication (?) operates on whatever is to the *left* of it using the smallest scope possible.

Dyadic. The scope for conjunction (∧), disjunction (∨), material implication (→) and material equivalence (↔) is whatever is to the left and to the right of it, using the smallest scope possible.

Formalizing

The system is rather intuitive. When one answers a question with "Yes", one affirms the claim that the question is about. When one answers a question with "No", one denies the proposition that the question is about. For example:

"Is it raining?"

If one answers "Yes" and is being truthful, it is because one affirms the proposition:

It is raining.

If one answers "No" and is being truthful, it is because one denies the proposition above, and/or affirms the proposition below[IV]:

It is not the case that it is raining.

How might one formalize the above? In the Y/N-logic system it is done like this:

F1. R?

interpretation keys: R = “It is raining”.

The two propositions are formalized standardly:

F2. R

F3. $\neg$R

The affirmative and negative answers are formalized like this, respectively:

Y

N

And so, answering the question with “Yes” is equivalent with affirming F2. And, answering the question with “No” is equivalent with affirming F3.

Now we can begin to answer the first question posed in the section 2: Correctly answering a question means giving answer that 'results' in a true proposition. Let's assume that it is raining. If one answers “Yes” to the question “is it raining”, then one has answered the question correctly. This is because the claim F2 is true. If one answers the question with “No”, one has answered the question incorrectly. This is because the claim F3 is false.

There is a slight complication to this. In some contexts answering a question correctly may not actually mean giving the correct answer. I will ignore this for the moment and return to it after the main system has been introduced (see section 11).

5 The system for I-questions

Similarly to before, I list below the complete system. Note that it requires the addition of identity to first order predicate logic.

Constants, variables and pseudo-term:

A, ..., Z except Y, N	Propositional constants

IV The difference may in very special contexts be significant, so I am reluctant to say that they are the same, but they are very close and for present purposes it does not matter.

a, ..., w, except t	Particular constants (is a term)
x, y, z, t	Particular variables (is a term)
A_n, A_{nn}, ..., Z_n, Z_{nn}, ...	Predicate constants. The operands of predicates are terms. There can be any positive integer number of operand spaces
?	Identifier

Logical operators:

¬, ∧, ∨, →, ↔	Negation, conjunction, disjunction, material implication, material equivalence

Quantifiers:

∃, ∀	Existential quantification, universal quantification

Other symbols:

(,)	Parentheses. Used to avoid having to rely on order of operations
=	Identity (also necessary for question/answer logic)

Question logic symbols:

?	Question indication
Y, N	Answers: affirmative and negative, respectively

As it can be seen, the system above uses the same symbols as standard first order predicate logic with identity except for the "?" symbol and the alternative use of "Y" and "N".

Some (more) preliminary remarks about kinds of WFFs

As with before, it is necessary to introduce some extra jargon which is not necessary for standard first order predicate logic with identity. In standard first order predicate logic with identity, there is only one kind of WFFs and one grammar those WFFs. But in the system for dealing with both I-questions and Y/N-questions, it is necessary to introduce different kinds of WFFs:

1. NWFFs - Normal Well-Formed Formulas
2. QAWFFs - Question/Answer Well-Formed Formulas

1. YNWFFs - Yes/No Well-Formed Formulas
    1. YNQWFFs - Yes/No Question Well-Formed Formulas
    2. YNAWFFs - Yes/No Answer Well-Formed Formulas
2. IWFFs - Identifier Well-Formed Formulas
    1. IQWFFs - Identifier Question Well-Formed Formulas
    2. IAWFFs - Identifier Answer Well-Formed Formulas

Each of the fundamental levels above has its own grammar. These are given below.

Grammar for NWFFs

This is the normal grammar for standard predicate logic with identity (similar to Priest (2001:264)). NWFFs are those that can be made from the rules below using recursion. Examples are given under each rule in italic text.

1. Any propositional constant alone is a NWFF.

   "A"

2. If "α" is a NWFF, then so is "¬α".

   "¬A"

3. If "α" and "β" are NWFFs, then so is "α∧β". The same applies for the symbols: "∨", "→", "↔".

   "A∧B", "A∨B", "A→B", "A↔B"

4. If "α" is a NWFF, then so is "(α)".

   "(A)"

These are the same first four rules as for the first system. The same notes given to the first system apply here.

Using "Γ" to mean an n-operand predicate[V], the additional rules are (examples below each rule in italics):

5. If "t_1", ..., "t_n" are an n number of terms, and "Γ" is an n-operand predicate, then "Γt_1, ..., t_n"

V This is difficult to express clearly in little space. "Fx" is a 1-operand predicate, because it has space for only one operand. Operands of predicates are particular constants and variables. These are also called n-place predicates. Cf. Priest (2001:264).

is a NWFF.

*"Fa", "Fab", "Gaxby"**

6. If "α" is a NWFF, then so is "∀xα". The same applies to "∃".

   *"∀xFx", "∃xFyy", "∀xFb"**

7. For any two terms, "t_1" and "t_2", "$t_1=t_2$" is a NWFF.

   *"a=b", "a=x"**

8. If a formula contains a particular variable which does not appear in precisely one quantifier as an operand and at least one predicate, then that formula is not a NWFF. This rule supersedes all other rules.

   The formulas marked above with asterisk "" are not NWFFs because of rule 8. The first has two free particular variables. The second has a particular variable that does not appear in a predicate. The third because there is a free particular variable.*

Grammar for QAWFFs

Grammar for YNQWFFs

1. If "α" is a NWFF, then is "(α)?" is a YNQWFF and no longer a NWFF.

   "(A)?"

This makes it the case that each YNQWFFs has precisely one "?" symbol.

Grammar for YNAWFFs

1. "Y" and "N" are YNAWFFs

That means that there are precisely two YNAWFFs.

Grammar for IQWFFs

1. If "α" is a NWFF that contains a particular variable, v_1, then "α∧(v_1=?)" is a IQWFF and no longer a NWFF.

   ∃xRx∧(x=?)

Grammar for IAWFFs

1. Any single particular constant is a IAWFF.

   "a", "f"

There is a complication here. There is another kind of answer that is meaningfully given as an answer to I-questions, and there is a corresponding rule for that kind of answer, but it eludes my attempts to 'capture' it so far.

The first kind of I-answer is a single particular constant (corresponds to the first rule), e.g. "a". I.e., any single particular constant (not variables) is a IAWFF.

To use the example from earlier:

> "Who is the current president of the US?" (As of writing in Jan. 2012.)
>
> "Barrack Obama"

is *a* correct answer. There may be multiple correct answers (in fact, I cannot think of an I-question that does not have multiple correct answers[VI]). "Obama" would probably be regarded as a correct answer as well even though it is indeterminate; It could refer to any person with the name "Obama" which includes Barrack Obama's family etc. (more on indeterminateness later, see section 12).

The second kind of I-answer is 'answering with a predicate' (more on this later, see section 12). To use the example again:

> "Who is the current president of the US?" (As of writing in Jan. 2012.)
>
> "The successor of George W. Bush"[VII]
>
> "The son of Stanley Ann Dunham and Barack Obama, Sr"

Both of these answers are correct, although they may be inadequate for the situation in which they were asked (see section 11).

Scope of logical operators

The scope of the normal connectives are the normal scopes.

Monadic. The scope of negation (¬) is whatever is to the right of it using the smallest scope

VI Depends on how many descriptions there are that refer to an individual. Even if we limit it to unique identifying descriptions, it seems to me that there is either an extremely large number of such descriptions or infinitely many.

VII As in, the president following him, not the president in the next period, which could be the same person; George Bush was the president for two periods.

possible. The scope of question indication (?) operates on whatever is to the *left* of it using the smallest scope possible.

Dyadic. The scope for conjunction (∧), disjunction (∨), material implication (→) and material equivalence (↔) is whatever is to the left and to the right of it, using the smallest scope possible.

The use of "?" in the system

The symbol "?" has two uses in this system, but is not ambiguous because the contexts always makes it clear which one is meant. First, "?" can be a propositional operator similar to the other operators. Example: "(R)?"

Second, "?" can be a pseudo-term. It is similar to terms but can only appear once. When it has this role it always appears to the right of an equal to sign (=). Example: "∃xHx∧(x=?)"

Formalizing

This system is not as simple as the one before. But is rather intuitive, and this is despite what it may seem from the even more tedious symbolism above.

How does one formalize a question such as?:

> "Who is the current president of the US?" (as of Jan. 2011)

The correct answer to this question is of course "Barrack Obama". How should we symbolize this? One can do it like this:

> ∃xPx∧Ux∧(x=?)
>
> interpretation keys: Px = "x is a person", Ux = "is the current president of the US"

In other words, if we translate this back to a controlled natural language[VIII] (using English), we get something like:

> There is an x such that x is a person and x is the current president of the US, and what is x identical with?

or, with a more natural language:

> There is a person who is the current president of the US, and who is that person?

This is exactly what the question means. We can now begin to see how one can answer the third

VIII See Wikipedia about that concept: http://en.wikipedia.org/wiki/Controlled_natural_language and see the introduction to the Attempto Controlled English at http://attempto.ifi.uzh.ch/site/courses/.

question in section 2: What the example question above 'assumes'/implies (see section 8) is that there is a person, and that that person is the current president of the US. The 'assumptions'/implications of this question are true, but it need not necessarily be the case. When the 'assumptions'/implications are not true, the question commits the loaded question fallacy.[IX]

More examples of I-questions

“The wife beater”

The most famous example of the loaded question fallacy is this question (called “the wife beater”):

> “Do you still beat your wife?”

We can now analyze this question and see which 'assumptions' it 'makes'/implications it has. It gets a bit complicated due to the use of past-tense. One formalization of the question is:

> $(\exists x \exists y) Yx \wedge Wyx \wedge Bxy \wedge (Sxy)?$
>
> interpretation keys: Yx = “x is you”, Wxy = “y is the wife of x”, Bxy = “x has beaten y in the past”, Sxy = “x still beats y”.

Translating this to a controlled English language we get something like:

> There is a person x, and there is another person y, such that x is you, and y is the wife of x, and x has beaten y in the past, and is it the case that x still beats y?

or in a more natural language:

> You have a wife, and you have beaten her in the past, and do you still beat her?

Now, the 'assumptions'/implications of the questions are quite clear. It is 'assumed'/implied that two people exist, and they have a certain relation (are married), and a certain event has happened in the past (the man has beaten his wife) and the asked part is whether the man still beats his wife.

A car outside

The question:

> “Is there a car outside?”

A formalization:

> $(\exists x Cx \wedge Ox)?$

IX Gary N. Curtis - Fallacyfiles.org - “Loaded Question” - URL=http://fallacyfiles.org/loadques.html interpretation keys Cx = “is a car”, “Ox” = “is outside”

is tempting but it is unsatisfactory. It does not show the implication that the question has. The formalization

∃xOx∧(∃yCy∧Lyx)?

interpretation keys Ox = “is identical with outside”, Cx = “is a car”, Lyx = “y is located in/at x”

is 'deeper'. It correctly 'captures' that the question 'assumes'/implies that there is a place such that it is outside. The first formalization does not 'capture' that subtle detail. A more 'deep' formalization would 'capture' further details, such as the relationship between “here” and “outside”.

Translating back to a controlled English language we get something like:

There is a thing x, such that x is identical with outside, and is it the case that there is a thing y such that y is a car and y is located outside?

or in a more natural language:

There is a place outside, and is there a car outside?

A car

The question:

“Do you have a car?”

A formalization:

∃xUx∧(∃yCy∧Oxy)?

interpretation keys: Ux = “is identical with you”, Cx = “is a car”, Oxy = “x owns y”

Translating back to a controlled English language we get something like:

There is a thing x such that x is identical with you, and is it the case that there is a thing y such that that thing is a car and y is owned by x?

Or in a more natural language:

There is a person who is you and does that person have a car?

6 Some remarks about interpretation and WH-words

Languages such as English have a collection of words used for asking questions (not only that but mostly that), commonly referred to as the WH-words. They are: “what”, “where”, “when”, “who”, “which”, and “why”. These function as more or less implicit predicates. Asking a question with a “where” means that one is inquiring about a location. Asking a question with “when” means that one is inquiring about a point in time. Asking a question with “who” means that one is inquiring about a person. Asking a question with “why” means that one is inquiring about a reason. One should keep this in mind when interpreting questions such as:

“Who is in the room?”

which one may formalize as:

$\exists xPxIxr\wedge(x=?)$

interpretation keys: Px = “x is a person”; Ixy = “x is in y”, “r” = “the room”

and so if one translated this back into a controlled English language one would get something like:

There is a thing, x, such that x is a person and x is in the room, and with what is x identical with?

or in a more natural language:

There is a person in the room and who is s/he?

Note how this would be different if the question was instead:

“What is in the room?”

as this question does not have the 'assumption'/implication that it the thing in the room in a person.

7 Other kinds of 'answers'/responses

I mentioned earlier that there are some utterances that are meaningfully given as 'answers' to any given question, no matter if it is a I-question or Y/N-question. I focus on one kind of 'answer' here: “I don't know”. It is a sort of meta-answer in that it is a claim about the information sought by the person asking the question. Technically, in the present system, it is not an answer to the question. When people say “I don't know” they are not trying to *answer* the question. I am going to distinguish between responses and answers. Answers are those kind of responses that 'try' to 'answer' a question. Responses like “I don't know” are not answers in this terminology. Likewise, responding to the wife-beater question with something like “The question is incorrect” or “The question has wrong 'assumptions'/implications” is *not* an answer to the question, correct or not. In the present system, such responses are not answers. Other similar non-answer responses are “maybe”, “perhaps”, “it's possible”.

However, responding “I don't know” can still be false. This is normally the case when the subject subject lies (as when politicians lie about knowing about some scandalous affair). Because “I don't know” is a meaningful declarative sentence, it expresses a proposition like others of its kind and it can be formalized.

8 Does it make sense to say that questions “assume” (etc.) things?

One of *my* motivations for trying to create a logic of questions and answers was my dissatisfaction with the way people typically talk about what questions 'do'. I think that one of the things that go horribly wrong in philosophy is the rampant use of language that does not mean anything, or is at best obscure. I tried to get people to explain what they meant when they said things such as “The question assumes that ...” or “The question presupposes that ...” but without getting a useful answer. But it still seemed to me as if this was some kind of metaphor/non-literal language that made sense but people were not sufficiently clear about *how* to make sense of it. Thus, I wanted to try to make sense of it.

Assuming, presupposing, presuming are actions that persons do. When we speak of persons assuming things, it is relatively clear what it is that we mean (in the context of reasoning):

> Assume = 10. *trans*. To take for granted as the basis of argument or action; to suppose: that a thing is, a thing to be. (From Oxford English Dictionary, electronic version.)

But it does not make sense to speak of questions reasoning, and hence not to say that they assume/presuppose/presume something. However, the person asking the question may do just that. So, it seems to be some kind of extended meaning from that. The obvious interpretation is: When we say that a questions assumes (etc.) something, what we mean is that the person asking the question does that. This works for many cases, but not all. The person asking the question may not be truthful, or it may be a question that no one is asking, e.g., a question automatically generated by a computer, or a question mentioned/considered in a linguistics/philosophy class (not used, cf. Use/Mention distinction, see Cappelen & Lepore (2012)).

I am aware that arguing that some linguistic object does not mean anything is a very hard job and I don't think that my remarks above will convince many people. A more elaborate argumentation is probably needed.

9 Questions with a limited list of answers

Some questions specify a list of possible[X] answers, with the implication that one of them is correct. For instance:

“Are you at home or at work?”

One formalization is:

$\exists xLxAyx\wedge(x=h\vee x=w)\wedge(x=?)$

interpretation keys: Lx = “x is a location”, y = “you”, h = “home”, w = “work”.

Some questions 'list' possible answers that form a logically exhaustive list. Some questions do not, such as the above. An example of a question that 'does' is:

“Are you at home or at work or somewhere else?”

one formalization of that is:

$\exists xLxAyx\wedge(x=h\vee x=w\vee x=s)\wedge x=?$

interpretation keys: Lx = “x is a location”, y = “you”, h = “home”, w = “work”, s = “somewhere else”.

In this, there is a catch-all category of “somewhere else”. It is logically impossible to not be in one of these places.

I note that, in a way, Y/N questions are a kind of limited answer list question in that there are only two possible answers. It is possible to develop a single general logic of questions and answers that can deal with both kinds of questions (Y/N- and I-questions). In fact, I made such a logic before but it was hopelessly complicated, which is why I changed to using the system in this paper instead: It is more useful.

10 Multi-questions and conditional questions

Multi-questions

None of the questions considered so far as examples have been multi-questions, such as:

X In the ordinary language sense, not in any modal logic sense.

“Who is the president of the US and who is his wife?”

which is a non-conditional multi-question. One formalization of it is:

$\exists x \exists y Px \wedge Wyx \wedge (x=?) \wedge (y=?)$

interpretation keys: Px = “x is the president of the US”, Wxy = “x is the wife of y”

Such a formalization as the above is not a WFF in the system as proposed earlier (it has two ?'s). However, one could expand the system to work with that as well, if one wants to. I suspect, that the resulting rules would be rather sophisticated. I may attempt to formulate them in a later paper.

Conditional questions

None of the questions considered so far as examples have been conditional questions, such as:

“Are you homosexual, and if so, do you have a partner”

The “if so” part, makes it clear that the second question is a follow up to the first if the first question is answered affirmatively (i.e. with “Y”). This presents some difficulty for formalization, but one formalization is:

$(Hy)? \wedge Y \rightarrow (Py)?$

interpretation keys: Hx = “x is homosexual”, Px = “x has a partner”, y = “you”

Using Y in this way works for multi-questions consisting of two questions. It does not work for those with more than two. There are multiple ways one could change/extend the system to allow for this, one could use subscript numbering under the answers to indicate which question they are associated with. One way to do this is simply numbering from from the left, so another formalization of the above is:

$(Hy)? \wedge Y_1 \rightarrow (Py)?$

It gets a bit tricky with multi-I-questions such as:

“Who is the tallest person in the class, and if it is Peter Tallman, does he have a girlfriend?”

one formalization of the question is:

$(\exists x)Tx \wedge (x=?) \wedge x=p \rightarrow (Gp)?$

11 Answering a question correctly, again

There are some contexts where one may be said to answer the question correctly without actually giving the correct answer. I think that this use of “answering the question correctly” is an extended use of the normal use of the phrase.

The prototypical example of this situation is in a school situation where the correct answer to the teacher's question is the one the teacher has in mind or is in the book or similar. This kind of situation is an instance of the broader kind of situation where it is about giving the socially accepted or required answer to a question. Another example of this kind of situation would be if one is at a job interview and the interviewer asks one about one's views about something controversial. As it happens, one knows that if one gives the answer that one thinks is correct (and is correct), one will not (or unlikely) get the job. One could say that giving the correct answer here is answering whatever that will result in one getting the job, i.e., giving whatever answer that furthers one's interests.

I don't think this kind of situation is a problem for my system of logic although it is a slight complication.

12 Indeterminateness

Suppose you are in a class and the teacher asks you:

> “Who is the tallest person in this class?”

There are many, many correct answers to this question. Normally, the teacher expects you to name the person, but technically it is not specified in the question. Supposing that Peter Tallman is the tallest person in the class, the answer:

> “Peter Tallman”

is a correct answer. But supposing that Peter is the only person in the class named “Peter”, the answer:

> “Peter”

is also correct and uniquely identifying. Supposing that Peter is the only male in the class, the answers:

> “The male in the class”
>
> “The person with Y-chromosomes in the class”

are also correct and uniquely identifying, although perhaps not quite what the teacher expected.

In all of the above examples, the answer was uniquely determinate, i.e., the answer allowed one to unique identify an individual. Not all correct answers are like that. Supposing that, contrary to before, there are two people named “Peter” in the class (Peter Tallman and Peter Shortman), the answers:

> “Peter”
>
> “The male in the class”
>
> “The person with Y-chromosomes in the class”

are all indeterminate, i.e., fail to unique identify a person in the class. It could be either Peter Tallman or Peter Shortman but the answers do not make it possible to say which it is. An alternative interpretation is that the answers given above are ambiguous as to what proposition they express and as such, some of the propositions expressed are false (those about Peter Shortman) and others true (those about Peter Tallman).

This problem sometimes happens when answering an I-question with a 'predicate answer'. Predicate answer is here an answer that one would normally interpret as using a predicate. However, whether one uses a predicate in the formalization is often arbitrary, so technically, it does not have to be a predicate answer. One could regard e.g. “The male in the class” as a predicate, say “Mx”, or regard it as a name of a particular constant, say “m”.

The ultimate way to answer a question correctly but keeping it as indeterminate as possible is to use the terms used in the question to answer it, so answering something like:

> “The tallest person in the class.”

This answer is a tautology (stretching that term a bit) because it is equivalent with claiming:

> “The tallest person in this class is the tallest person in this class.”

13 Applications

But in the end, the real test of any system of logic is how useful it is. It can be all fine and dandy with fancy proofs and stuff, but if it is not useful, then why bother to learn it? The question is then: How useful is the system in this paper? I think it is rather useful. Learning to use the system makes one better at spotting problematic/questionable/false implications/'assumptions' of questions that others miss.

Considering that the first step to answering a question is to analyze the question.[XI] This applies also to philosophy, and one might say especially to philosophy. Nowhere but in philosophy are there asked so many questions with hidden 'assumptions'/implications.

It seems obvious to me that one could want a system of logic for analyzing questions. The reasons for having that is similar to those for having a logic about arguments in general, or modal logics for various kinds of modalities (alethic, temporal, deontic, epistemic (cf. Garson 2009)): It is a useful tool that makes it easier for one to perform an analysis/assessment of the thing in question, and see flaws that might not be very obvious but are there nonetheless.

Famous questions

Besides the wife-beater question which was used as an earlier example, here are some more famous questions of philosophy and an analysis of each of them in my system.

"What is it like to be a bat?"

Thomas Nagel's famous question (see Nagel (1974)).

One formalization is:

> $(\exists x \exists y) Wxy \land By \land (x=?)$
>
> interpretation keys: Wxy = "x how it is like to be y", Bx = "x is a bat".

Translating to a controlled English language, one might get:

> There is a thing, x, and there is another thing, y, such that x is how it is like to be y, and y is a bat, and what is x identical with?

Or to a more natural english:

> There is some way it feels like to be a bat, and which way is that?

XI This is often given as advice. See e.g. (picking two more or less arbitrary examples from Google): http://www.jcu.edu.au/tldinfo/writingskills/writing/question.html, www.macmillanreaders.com/wp-content/uploads/2010/07/WriteaDetailedEssay.pdf

Following such an analysis it is pretty clear what the question 'assumes'/implies, and one may use this knowledge to properly consider if one should reject the question as being loaded or try to answer it in some way, or perhaps talk about the answer (such as that it is impossible to know the answer which still implies that there is a correct answer.). Some philosophers did exactly that, of course, with Daniel Dennett being the first that comes to mind as rejecting the question (though he did not use this term), i.e., denying that there is qualia (e.g. Dennett 1991).

“What happens when an unstoppable force meets an unmovable object?”

A typical trick question[XII] used on children. We may analyze it to clearly show what it wrong with it. Here is one formalization:

> $(\exists x \exists y \exists z)Fx \wedge Oy \wedge Hzxy \wedge (z=?)$
>
> interpretation keys: Fx = “x is an unstoppable force”, Ox = “x is an unmovable object, Hxyz = “x is what happens when y meets z”.

We can translate back into a controlled English language and get something like:

> There is a thing, x, and there is a thing, y, and there is a thing, z, such that x is an unstoppable force, and y is an unmovable object, and z is what happens when x meets y, and with what is z identical with?

Or in a more natural English:

> There is an unstoppable force and there is an unmovable object, and something happens if they meet and what is that?

From which it can clearly be seen that the question 'assumes'/implies that it is possible that there is a world with both an unstoppable force and an unmovable object. This is not logically possible.

I submit, though, that my analysis is a bit simplified because I ignored the implicit hypothetical nature of the question. But still, the analysis is useful. Hypothetical questions are supposed to describe a possible situation, and if that is not the case, then the question should be rejected.[XIII]

“Why is there something rather than nothing?”

This is another famous question, but it doesn't seem to have a specific person associated with it (see

XII Notice that trick questions are really just loaded questions, perhaps of a special kind. People who ask them try to trick people into accepting the hidden 'assumptions'/implications of the question without arguing them.

XIIII am here simplifying it again. If e.g. dialetheism was true, then my remarks would perhaps not apply. See Priest (1987), and but see Priest & Berto (2010) for a shorter introduction.

Sorensen (2009), section 1). Again, I analyze the question using the system proposed in this paper. Here is one formalization:

> ∃xRx
>
> interpretation keys: Rx = “x is a reason why there is something”.

Translating back into a controlled English language, one might get:

> There is a thing, x, such that x is a reason why there is something rather than nothing, and what is x identical with?

Or, in a more natural English:

> There is a reason why there is something rather than nothing and what is that reason?

The use in the question of the word “why” informs us that a reason is sought (see section 6).

Upon realizing what the question 'assumes'/implies, one may want to reject it because the 'assumption'/implication is false. Of course, the question even analyzed as above is rather unclear. What kind of reason is sought? A reason as in, a conscious reason for doing something? If that is the case, then there is no such reason. A reason as in, an explanation using laws of nature why there is something rather than nothing? There may be a such, but I don't know. In any case, it does not seem very important to me. Too much attention seems to have been given to this obscure and seemingly practically irrelevant question.

14 Conclusion

I think I have made a worthwhile attempt at designing a logical system for questions and answers. Specifically, I have succeeded in doing what I set out to do in section 2. However, surely, this system is not perfect, and there are many things left to discuss (such as ontological implications). I have run out of space, so I will do that in another paper.

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