Necessary and Sufficient Conditions

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Definitions

- Among the many things we do in philosophy, we try to provide analysis of terms we find interesting (e.g. free will, the good, knowledge, belief, the mind). One way to do this is to give a definition.

- There is a linguistic sense of definitions which is looking for substitutable words. E.g. Amazing = causing great surprise or sudden wonder.

- This is often not helpful in understanding things if the words in the definition are no more clear or of there are small loops (e.g. where “cause” is defined in terms of “effect” and vice versa)

- There is another sense of definitions which highlights important or essential characteristics of a thing.

- This is more helpful, but often quite difficult to formulate.
Necessary and Sufficient Conditions

- One helpful thing to do instead of giving a definition is to give necessary and sufficient conditions for a thing.
- Necessary and sufficient conditions try to use other words to pick out all the same things as a given word (so they are coextensive).
- Unlike definitions, necessary and sufficient conditions do not need to be connected to the meaning of the term at all. In fact, giving necessary and sufficient conditions for a term often increases our understanding of that term, so they couldn’t possibly be merely stating the meaning of the term in other words.
- More formally, if P and Q are states of affairs (such as a predicate being true of an object), then
  - P is sufficient for Q if and only if (hereafter iff) necessarily, if P obtains then Q obtains (P⇒Q).
  - P is necessary for Q iff necessarily, if Q obtains then P obtains (P⇐Q)
Examples

P is sufficient for Q iff necessarily, if P obtains then Q obtains.
P is necessary for Q iff necessarily, if Q obtains then P obtains.

Is the antecedent necessary, sufficient, necessary and sufficient, or neither for the consequent?

- Having the right key is _____________ for a capable human to be able to open a lock.
- It having rained recently is _____________ for the ground being wet.
- Being two hydrogen atoms bonded to an oxygen atom is _____________ for being water.
- Hating the weather is _____________ for being in South Bend in the winter.
- Being in South Bend is _____________ for being in Indiana.
- Being highly intelligent is _____________ for going to Notre Dame.
- Being catholic is _____________ for being the pope.
Examples

P is **sufficient** for Q iff necessarily, if P obtains then Q obtains.

P is **necessary** for Q iff necessarily, if Q obtains then P obtains.

- Showing up to class is ____________ for getting an A.
- Being mortal is ____________ for being human.
- Being a rational animal is ____________ for being human.
- Being a featherless biped is ____________ for being human.
- Being 2, 4, 6, or 8 is ____________ for being an even number.
- Being 2, 4, 6, or 8 is ____________ for being an even number <10.
- Being such that when divided by 2 it is 1, 2, 3, or 4 is ____________ for being an even number <10.
Creating Necessary and Sufficient conditions

P is sufficient for Q iff necessarily, if P obtains then Q obtains.

P is necessary for Q iff necessarily, if Q obtains then P obtains.

While identifying a connection between things is important, it is much more common in philosophy to have to come up with necessary and sufficient conditions from scratch.

Formulate necessary and sufficient conditions for the following:

- For someone to have scored a touchdown
- For something to be a car
- For something to be a sandwich
- For a person to be telling a joke
- For a person to have free will
- For a person to be running