

0.1 Discussion of the conditions necessary and sufficient

Edward Morey: necsuff.pdf January 16, 2012

read "Tommy at the Grocery Store" - an important treatise on logic

My two favorite words: N _ _ _ _ _ _ _ _ and S _ _ _ _ _ _ _ _

If you understand the distinction between necessary and sufficient, you will lead a better life.

An understanding of these two terms is a necessary condition for understanding economic models and theories.

Bob, one of my psychologist friends (there are many psychologists in Boulder—I live on a short street and there used to be six of them on my street) often treats patients using these concepts (having a pain in your leg does not imply you will die of cancer next week, that your significant other did not get home on time does not imply that he/she is either dead or was having sex with someone else). Bob often read them "Tommy at the Grocery Store."

With these examples in mind:

Consider two things, denoted A and B .

0.1.1 A is necessary for B if the existence of B requires the existence of A .

Said in symbols: (A is necessary for B) \Leftrightarrow ($\text{not}A \Rightarrow \text{not}B$) \Leftrightarrow ($B \Rightarrow A$) \Leftrightarrow (B is sufficient for A) \Leftrightarrow (B only if A)

What does \Rightarrow mean? it means *implies*

\Leftrightarrow means the implication goes both directions. If $A \Leftrightarrow B$, A and B are equivalent. Said another way, $(A \Leftrightarrow B) \Leftrightarrow A \text{ iff } B$

0.1.2 A is sufficient for B if the existence of A implies the existence of B .

Said in symbols: (A is sufficient for B) $\Leftrightarrow (A \Rightarrow B) \Leftrightarrow (B$ is necessary for $A) \Leftrightarrow (not B \Rightarrow not A) \Leftrightarrow (B$ if $A)$

Identify a condition that is necessary but not sufficient for something to be a house? economist, rug, beer, person, give each group a different term.

Sufficient but not necessary?

Necessary and sufficient?

Consider what one needs to do to define something on a test, such as the test question "Define a giraffe." What is a correct answer and how does it relate to the necessary and sufficient conditions.

Students often lose points on exams (in this course and many other courses in the University) because they confuse, necessary, sufficient, and necessary and sufficient.

Consider dictionaries: what is a definition? what properties do ideal definitions have?

Can you identify necessary and sufficient conditions for a thing to be an animal.

Consider conditions that are necessary but not sufficient for something being an animal.

alive?
has DNA?
breathes?
uses energy?

do any of these imply any of the others.

It is difficult to define conditions that are necessary for something to be animal.

It is easy to define a condition that is sufficient but not necessary for something to be an animal

It is difficult to define the conditions that are both necessary and sufficient.

A questions: are the following two statements equivalent?

Z is sufficient for A

Z is an example of A

Yes, George the Gorilla is an example of a Gorilla (being George the Gorilla is sufficient to make him a gorilla).

Being a "one-percenter" (one's income is in the top 1% of all incomes) is sufficient to make you rich. But it is not necessary, you do not have to be in the top 1% to be rich.

All beautiful blondes are beautiful but you don't have to be blonde to be beautiful.

If you want more just Google "necessary and sufficient"

For example:

Necessary and sufficient condition - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Necessary_and_sufficient_condition

Necessary and Sufficient Conditions (Stanford Encyclopedia of Philosophy)
plato.stanford.edu/entries/necessary-sufficient/

Necessary vs. Sufficient Conditions
philosophy.wisc.edu/hausman/341/Skill/nec-suf.htm

The Concept of Necessary Conditions and Sufficient Conditions
www.sfu.ca/~swartz/conditions1.htm