1.4: Necessary and Sufficient Conditions

The concepts of necessary and sufficient conditions help us understand and explain the different kinds of connections between concepts, and how different states of affairs are related to each other.

To say that X is a necessary condition for Y is to say that it is impossible to have Y without X. In other words, the absence of X guarantees the absence of Y. A necessary condition is sometimes also called an essential condition.

Some examples:

- Having four sides is necessary for being a square.
- Being brave is a necessary condition for being a good soldier.

To show that X is not a necessary condition for Y, we simply find a situation where Y is present but X is not. Examples:

- Being rich is not necessary for being well-respected, since a well-respected teacher might in fact be quite poor.
- Living on the land is not necessary for being a mammal. Dolphins are mammals, but they live in the sea.

We use the notion of a necessary condition very often in daily life, even though we might be using different terms. For example, life requires oxygen is equivalent to saying that the presence of oxygen is a necessary condition for the existence of life.

A state of affairs can have more than one necessary condition. For example, to be a good concert pianist, it is necessary to have good finger technique. But this is not enough. Being good at interpreting piano pieces is another necessary condition.

Next, we turn to sufficient conditions. To say that X is a sufficient condition for Y is to say that the presence of X guarantees the presence of Y. In other words, it is impossible to have X without Y. If X is present, then Y must also be present. Some examples:
• Being a square is sufficient for having four sides.
• Being divisible by 42 is sufficient for being an even number.

To show that X is not sufficient for Y, we come up with cases where X is present but Y is not, such as:

• Having a large market share is not sufficient for making a profit. The company might be dominating the market by selling at a loss.
• Loyalty is not sufficient for honesty because one might have to lie in order to protect the person one is loyal to.

Expressions such as If X then Y, or X is enough for Y, can also be understood as saying that X is a sufficient condition for Y. Note that some state of affairs can have more than one sufficient condition. Being blue is sufficient for being colored, but being green, being red are also sufficient for being coloured.

Given any two conditions X and Y, there are at least four ways in which they might be related to each other:

• X is necessary but not sufficient for Y.
• X is sufficient but not necessary for Y.
• X is both necessary and sufficient for Y. (or jointly necessary and sufficient)
• X is neither necessary nor sufficient for Y.

This classification is very useful when we want to clarify how two concepts are related to each other, especially when it comes to more abstract concepts. For example, in explaining the nature of democracy we might say that the rule-of-law is necessary but not sufficient for democracy.