GST 48 – Variables and Values

Formal Description

A variable is a representation of a property that may take different values. A value specifies a particular position of that variable along its associated property dimension at a given time. Variables provide a means of describing and comparing entities, while values provide the specific information needed to describe their states. Together, variables and values form the basis of measurement, analysis and modelling within General Systems Theory.

Plain English Explanation

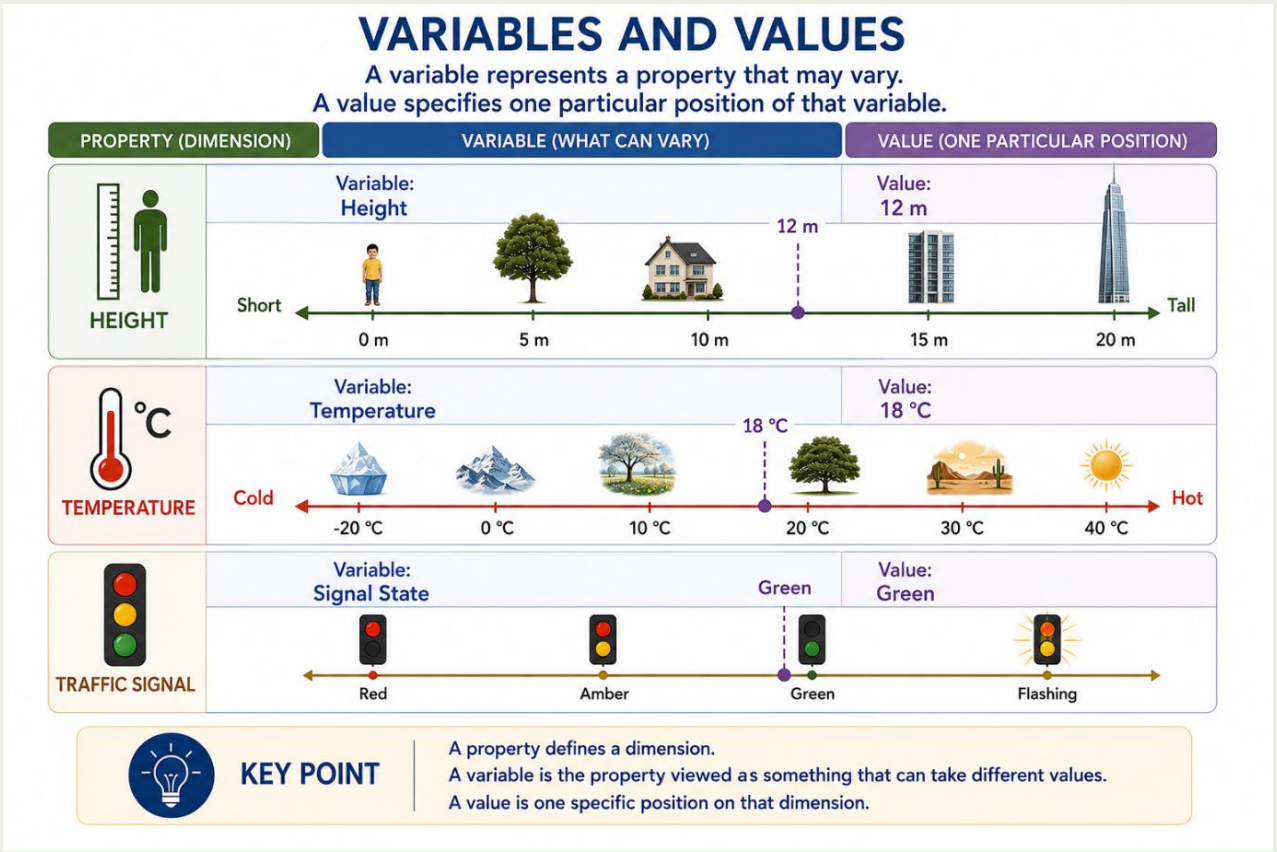
Many of the properties used to describe entities can vary. Height, temperature, speed and mass are all examples of properties that may take many different values. To describe such variation systematically, we use variables.

A variable represents a property that is capable of changing or taking different positions along a property dimension. For example, height is a variable because different objects have different heights. Temperature is a variable because it may increase or decrease. Population is a variable because the number of people in a town changes over time.

A value identifies the particular position of a variable at a specific moment. If a tree is 12 metres tall, then height is the variable and 12 metres is its value. If the outside temperature is 18°C, then temperature is the variable and 18°C is its value.

Variables do not always have numerical values. A variable describing traffic lights may take the values red, amber or green. A variable describing the operating state of a machine might take the values running, idle or stopped. What is important is that the possible values are clearly defined.

Variables and values allow us to describe reality in a precise and consistent way. In the next module we shall see how collections of variable values describe the state of an entity or system.



Examples

The speed of a car is a variable because it changes as the car accelerates or slows down. At one moment the speed may have the value 30 km/h, and a few seconds later it may have the value 50 km/h.

Similarly, the water level in a reservoir is a variable. Throughout the year it rises and falls in response to rainfall and water use. On a particular day the level may be 42.3 metres above sea level, which is the value of the water-level variable at that time.

Provenance and Links

The concepts of variables and values have their origins in mathematics, logic and the physical sciences, where they are fundamental to measurement and quantitative reasoning. During the nineteenth and twentieth centuries they became central to statistics, engineering, systems science and computer science. Within General Systems Theory, variables and values provide the means by which the properties of entities and systems are described, compared and monitored through time.

Practical Exercise

Choose five entities from your everyday surroundings. For each entity, identify one property that can vary and define an appropriate variable to represent that property.

Next, record the current value of each variable. Finally, explain how those values might change over time and what those changes would tell you about the entities you have chosen.