



GST 10 – Collections, Sets, and Aggregation

Formal Description

A **collection** is any plurality of entities.

A **set** is a collection of entities treated as a single entity.

Aggregation is the conversion of a collection into a set, while **disaggregation** is the conversion of a set into a collection.

A set exhibits **set duality**, whereby it may be regarded either as a single entity or as a plurality of its constituent members. The choice of perspective determines whether relationships are described at the level of the whole or of the parts.

Plain English Explanation

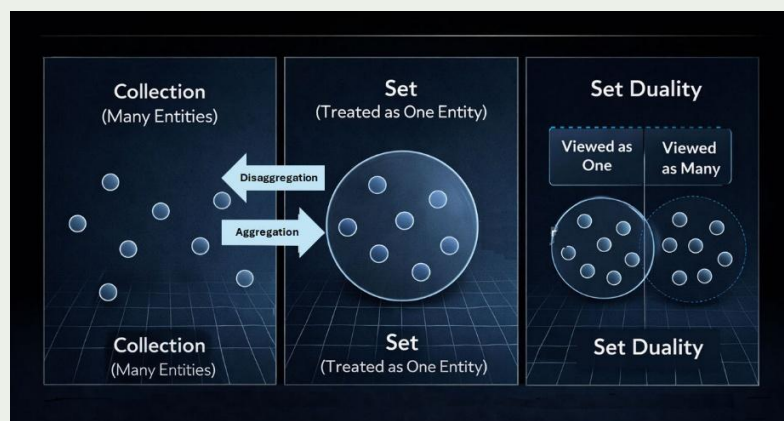
So far, we have looked at individual entities and their boundaries. The next step is to understand how multiple entities can be grouped together. A collection is simply a number of entities considered together, for example, a group of people, a pile of stones, or a number of trees in a forest. At this stage, we are simply recognising that there are many separate things present.

A set arises when we take such a collection and treat it as a single entity. For instance, instead of focusing on individual players, we may refer to a football team; instead of individual trees, we may refer to a forest; or we may describe a number of vehicles as a fleet. Importantly, nothing physical has changed, only the way in which we are considering the entities.

This shift in perspective allows us to move between two complementary ways of understanding the same situation. Aggregation refers to treating many entities as one, while disaggregation refers to breaking a whole into its constituent parts. This movement between levels of description is fundamental to systems science.

A key idea that follows from this is set duality. A set can be viewed both as a single entity and as a collection of constituent entities, and both perspectives are valid at the same time. This duality is what allows us to treat systems as unified wholes while also analysing their internal structure.

Without this ability to move between whole and parts, it would not be possible to study complex systems effectively. Set duality therefore provides a crucial foundation for understanding how systems are organised and how they function across different levels of detail.





Example 1 – A Football Team

A football team consists of individual players.

- As a collection → separate individuals
- As a set → “the team”

☞ The same group can be treated as one entity or many.

Example 2 – A Forest

A forest is made up of many trees.

- As a collection → individual trees
- As a set → a single ecological unit

☞ This allows us to study the forest as a system.

Example 3 – A Chess Set

A chess set consists of separate pieces.

- Physically → separate objects
- Conceptually → one entity

☞ This links directly to **discontinuous boundaries**.

Example 4 – A Data Set

A list of numbers can be treated as:

- individual values
- or a single data set

☞ This is essential in mathematics and science.

Provenance and Links

This module draws on foundational concepts from mathematics, formal logic, and systems theory concerning the grouping of entities and the relationship between wholes and parts.

The concept of a set as a collection of elements treated as a single entity originates in the work of Georg Cantor, who established set theory as a fundamental framework in mathematics. In this context, sets provide a formal way of representing plurality and unity, allowing multiple elements to be considered as a single object of analysis.

In systems theory, the treatment of collections as unified wholes is central to the work of Ludwig von Bertalanffy, who emphasised that systems must be understood both as organised wholes and as assemblies of interacting components. This dual perspective underpins the analysis of complex systems across different levels of organisation.

The processes of aggregation and disaggregation are widely used in systems analysis, modelling, and the study of complex systems, where it is often necessary to move between different levels of description. These ideas are closely related to hierarchical organisation and multi-level analysis in both natural and social systems.

The principle that a set can be understood both as a single entity and as a plurality of constituent elements reflects a broader theme in systems science concerning the relationship between whole and parts. This duality is fundamental to understanding how systems can be analysed, modelled, and interpreted at different levels of detail.



Within General Systems Theory, these concepts provide the basis for defining systems, subsystems, and levels of organisation, and for moving between aggregated and disaggregated representations of complex phenomena.

Practical Exercise

Choose one example from everyday life where a group of things can be viewed both as many and as one (for example: a class, a family, a collection of objects).

1. Describe the individual elements (collection view)
2. Describe the same group as a single entity (set view)
3. Explain how your understanding changes between these two perspectives

👉 Write a short paragraph explaining both views.