Why

We want language for recording the elements of some set that appear at regular intervals of time.

Definition

Let A be a set. An *observation sequence* (or *time series*) in A is a mapping $a : \mathbf{Z} \to A$.

If $A = \mathbf{R}^d$ in which case we call a a *vector-valued observation sequence* or *vector-valued time series*.

Examples

Examples include temperature readings, seismograph readings, sunspot numbers, export quantities, and so on.

Time invariance

The most basic assumption we can make is that the observation sequence a exhibits some regularity over time. This assumption is naturally related to the assumption of time-invariance in physical laws.[1]

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[1]Future editions will expand on this discussion.

Observation Sequences

Vectors

Real Vectors

N-Dimensional Space   Space Vectors   Plane Vector Sums and Differences

Distance   Plane Vectors

Space Distance

Plane Distance

Interval Length

Real Space   Intervals

Real Plane   Real Line

Integral Line   Real Order

Geometry   Rational Order   Real Numbers   Fields

Lists   Rational Numbers   Rings

Direct Products   Set Numbers   Integer Arithmetic

Finite Sets   Natural Multiplicative Identity   Natural Additive Identity   Integer Products

Equivalent Sets   Identity Elements   Arithmetic

Family Unions and Intersections   Function Inverses

Families   Function Composites   Function Images   Comparisons   Integer Order   Integer Sums   Natural Powers

Functions   Operations   Orders   Integer Numbers   Natural Products

Equivalence Relations   Converse Relations   Natural Order   Natural Sums

Relations   Recursion Theorem

Ordered Pair Projections   Peano Axioms

Set Products   Natural Induction

Generalized Set Dualities   Set Powers   Natural Numbers

Set Unions and Intersections   Partitions   Intersection of Empty Set   Set Dualities   Unordered Triples   Successor Sets   Set Symmetric Differences

Set Intersections   Ordered Pairs   Pair Unions   Set Complements

Pair Intersections   Set Unions   Set Differences

Unordered Pairs   Empty Set

Set Specification

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Sets   Identities

Names

Letters   Objects