Definition

The *data matrix* corresponding to a data set of n records which are length d tuples of real numbers is the n by d matrix whose ith row is the i element of the data set. Some authors refer to the data matrix as the *design matrix*.

Notation

Let $(a^1, \ldots, a^n)$ where $a^i \in \mathbf{R}^n$ for $i = 1, \ldots, n$. Let A be the $n \times d$ matrix whose rows are the a^i. Then A is the data matrix of $(a^1, \ldots, a^n)$. In other words,

$$A = \begin{bmatrix} (a^1)^\top \\ \cdots \\ (a^n)^\top \end{bmatrix}.$$

Data Matrix

Vectors as Matrices

Real Matrices — Real Inner Product

Linear Equations — Space Inner Product — Real Norm

Arrays — Linear Functions — Real Vectors — Space Norm

Space Vectors — Plane Vector Sums and Differences — N-Dimensional Space — Plane Norm — Plane Inner Product

Plane Vectors — Distance — Absolute Value — Right Triangle Sides Relation

Space Distance — Real Squares

Plane Distance — Real Arithmetic

Interval Length — Real Multiplicative Inverses

Intervals — Real Space — Real Products — Square Numbers

Real Plane — Real Line — Real Additive Inverses — Square

Real Summation — Rational Multiplicative Inverses — Real Order — Real Sums — Integral Line — Rational Arithmetic — Geometry

Real Numbers — Rational Sums — Rational Order — Rational Products

Rational Numbers

Integer Arithmetic

Lists — Integer Products

Set Numbers — Natural Additive Identity — Natural Multiplicative Identity

Direct Products — Finite Sets — Identity Elements — Arithmetic — Natural Powers

Inverse Elements — Equivalent Sets — Natural Summation — Natural Products

Family Unions and Intersections — Function Inverses — Family Operations — Element Functions — Comparisons — Natural Equations — Integer Order — Integer Sums

Families — Function Composites — Function Images — Operations — Equations — Orders — Natural Sums — Integer Numbers

Functions — Converse Relations — Natural Order — Equivalence Relations — Recursion Theorem

Relations — Peano Axioms

Set Products — Natural Induction

Generalized Set Dualities — Set Powers — Natural Numbers

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

Ordered Pairs — Pair Unions — Set Intersections — Set Complements

Pair Intersections — Set Unions — Set Differences

Unordered Pairs — Empty Set

Set Specification

Set Equality

Set Inclusion

Standardized Accounts

Accounts

Deduction

Quantified Statements

Logical Statements

Statements

Identities — Sets

Names

Letters — Objects