1 Sets

The universal set (\mathcal{U}) contains everything. The empty set (\emptyset) contains nothing. Some assignments:

$$\mathcal{B}_1 = \{1, 3, 5, 7\}, \quad \mathcal{B}_2 = \{2, 4, 6, 8\}, \quad \mathcal{B}_3 = \{9, 10\}$$

Define:

$$\mathcal{A} = \bigcup_{i=1}^{3} \mathcal{B}_i = \{1, \dots, 10\}$$

The cardinality of a set S is denoted |S| and is the number of elements in the set.

$$|\mathcal{B}_1| = 4, \quad |\mathcal{B}_2| = 4, \quad |\mathcal{B}_3| = 2, \quad |\mathcal{B}_1 \cup \mathcal{B}_2| = 8, \quad |\emptyset| = 0$$

2 Spaces

A number space (denoted S) is characterised by a set of entities with a set of axioms. For example:

 $\mathbb{N} = \{x : x \text{ is positive integer}\}$ $\mathbb{Z} = \{x : x \text{ is an integer}\}$ $\mathbb{R} = \{x : x \text{ is a real number}\}$

3 Vectors and Matrices

A matrix (denoted M) is a rectangular array of values. A vector (denoted v) is a column or row of values (that is a one-dimensional matrix).

$$Ix = x$$
, $AA^{-1} = I$, $x^{-1}\mathbf{1} = \sum_{i} x_i$

Glossary

| the identity matrix. | \mathbb{Z} | the set of integers. |
|--------------------------|---|---|
| the inverse of M . | \mathbb{N} | the set of natural numbers. |
| a matrix. | \mathbb{R} | the set of real numbers. |
| a vector. | | |
| the vector of 1s. | $ \mathcal{S} $ | the cardinality of \mathcal{S} . |
| | Ø | the empty set. |
| <i>n</i> -ary summation. | S | a set. |
| <i>n</i> -ary union. | $\{\ldots\}$ | set contents. |
| | $\{x:\ldots\}$ | set membership. |
| a number space. | U | the universal set. |
| | the inverse of M . a matrix. a vector. the vector of 1s. n-ary summation. n-ary union. | the inverse of M . \mathbb{N} a matrix. \mathbb{R} a vector. \mathbb{R} the vector of 1s. \emptyset n -ary summation. \mathcal{S} n -ary union. $\{\dots\}$ $\{x : \dots\}$ |