

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 \mathcal{S} is denoted $|\mathcal{S}|$ 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 \mathbb{S}) is characterised by a set of entities with a set of axioms. For example:

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

3 Vectors and Matrices

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

$$\mathbf{I}\mathbf{x} = \mathbf{x}, \quad \mathbf{A}\mathbf{A}^{-1} = \mathbf{I}, \quad \mathbf{x}^{-1}\mathbf{1} = \sum_i x_i$$

Glossary

\mathbf{I}	the identity matrix. the identity matrix.		space.
\mathbf{M}^{-1}	the inverse of \mathbf{M} . the inverse of \mathbf{M} .	\mathbb{Z}	the set of integers. the set of integers.
\mathbf{M}	a matrix. a matrix.	\mathbb{N}	the set of natural numbers. the set of natural numbers.
\mathbf{v}	a vector. a vector.	\mathbb{R}	the set of real numbers. the set of real numbers.
$\mathbf{1}$	the vector of 1s. the vector of 1s.		
$\sum \Sigma$	n -ary summation. n -ary summation.	$ \mathcal{S} $	the cardinality of \mathcal{S} . the cardinality of \mathcal{S} .
$\bigcup \bigcup$	n -ary union. n -ary union.	\emptyset	the empty set. the empty set.
		\mathcal{S}	a set. a set.
\mathbb{S}	a number space. a number	$\{\dots\}$	set contents. set contents.

$\{x : \dots\}$	set membership.	set member-	\mathcal{U}	the universal set.	the univer-
	ship.			sal set.	