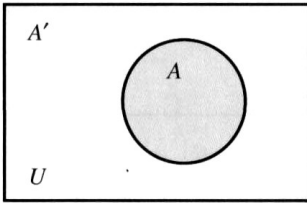


Universal Set (U)

Includes all things under discussion.



Complement of a Set

$$A' = \{x \mid x \in U \text{ and } x \notin A\}.$$

Subset of a Set

$A \subseteq B$ if B contains every element of A .

Proper Subset of a Set

$A \subset B$ if $A \subseteq B$ and $A \neq B$.

Number of Subsets (Formulas)

Any set with n elements has 2^n subsets and $2^n - 1$ proper subsets.

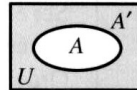
2.3 Operations with Sets

Common Set Operations

Let A and B be any sets, with U the universal set.

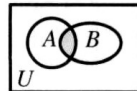
The **complement** of A , written A' , is

$$A' = \{x \mid x \in U \text{ and } x \notin A\}.$$



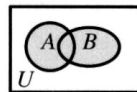
The **intersection** of A and B is

$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}.$$



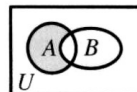
The **union** of A and B is

$$A \cup B = \{x \mid x \in A \text{ or } x \in B\}.$$



The **difference** of A and B is

$$A - B = \{x \mid x \in A \text{ and } x \notin B\}.$$



The **Cartesian product** of A and B is

$$A \times B = \{(x, y) \mid x \in A \text{ and } y \in B\}.$$

Cardinal Number of a Cartesian Product (Formula)

If $n(A) = a$ and $n(B) = b$, then $n(A \times B) = ab$.

Common Methods of Set Notation

Method	Example
1. Word description	The set of all students
2. Listing	$\{15, 25, 35, \dots, 95\}$
3. Set-builder	$\{x \mid x \text{ is a rational number}\}$

Cardinal Number of a Set

$n(A)$ is the number of elements in set A Example: $n(\{2, 4, 6\}) = 3$

A is **finite** if $n(A) = a$ counting number.

Otherwise, A is **infinite**.

Set Equality

$A = B$ if A and B contain exactly the same elements. Example: $\{a, b, c\} = \{c, a, b\}$

De Morgan's Laws

For any sets A and B ,

$$(A \cap B)' = A' \cup B'$$

and $(A \cup B)' = A' \cap B'$.

2.4 Surveys and Cardinal Numbers

Cardinal Number Formula

For any sets A and B , $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

2.5 Cardinal Numbers of Infinite Sets

Two sets are **equivalent** ($A \sim B$) if they can be placed in a one-to-one correspondence. For example, A and B below are equivalent.

$$\begin{array}{cccccc} A = \{1, & 3, & 5, & 7, & 9\} \\ & \downarrow & \downarrow & \downarrow & \downarrow \\ B = \{a, & e, & i, & o, & u\} \end{array}$$

Cardinal Numbers of Infinite Number Sets

Infinite Set	Cardinal Number
Natural or counting numbers	\aleph_0
Whole numbers	\aleph_0
Integers	\aleph_0
Rational numbers	\aleph_0
Irrational numbers	c
Real numbers	c