

Sets in MPL

An MPL set is a finite collection of expressions that is surrounded by the braces $\{$ and $\}$. For example, the expression $\{x + y = 1, x - y = 2\}$ represents a set with two members, the equations $x + y = 1$ and $x - y = 2$.

Following mathematical convention, MPL sets satisfy the two properties:

1. *The contents of a set does not depend on the order of the elements in the set.* This means that $\{u, v\}$ and $\{v, u\}$ are the same set.
2. *The elements of a set are distinct.* In other words, a set cannot contain duplicate elements.

Algebraic Operations On Sets Let A and B represent sets and let x represent an arbitrary expression. The following operations are defined for sets:

- *Union of Sets, $A \cup B$.* The *union* of sets A and B is a new set that contains all the elements in A or in B or in both sets. For example,

$$\{a, b, c\} \cup \{b, c, d\} \rightarrow \{a, b, c, d\}$$

where the expression to the right of the arrow is the evaluated form of the expression.

- *Intersection of Sets, $A \cap B$.* The *intersection* of sets A and B is a new set that contains all the elements that are in both A and B . For example,

$$\{a, b, c\} \cap \{b, c, d\} \rightarrow \{b, c\}.$$

- *Difference of Sets, $A \sim B$.* The *difference* of sets A and B is a new set that contains all the elements that are in A but not in B . For example,

$$\{a, b, c\} \sim \{b, c, d\} \rightarrow \{a\}.$$

- *Set membership, $x \in A$.* The expression $x \in A$ evaluates to **true** if x is in A , and otherwise evaluates to **false**. For example,

$$a \in \{a, b, c\} \rightarrow \mathbf{true}, \quad d \in \{a, b, c\} \rightarrow \mathbf{false}.$$

Following mathematical convention, we represent the empty set with the reserved symbol \emptyset .

Most computer algebra systems provide sets along with the algebraic operations described above (see Fig. 1).

MPL	Maple	Mathematica	MuPAD
set notation			
$\{a, b, c\}$	$\{a, b, c\}$	$\{a, b, c\}$	$\{a, b, c\}$
\emptyset	$\{ \}$	$\{ \}$	$\{ \}$
$A \cup B$	A union B	Union[A,B]	A union B
$A \cap B$	A intersect B	Intersection[A,B]	A intersect B
$A \sim B$	A minus B	Complement[A,B]	A minus B
$x \in A$	member(x, A)	MemberQ[x,A]	contains(A,x)

Figure 1. MPL Set operations in Maple, Mathematica, and MuPAD. (Implementation: [Maple](#) (mws), [Mathematica](#) (nb), [MuPAD](#) (mnb).)

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