A Review of Tuples and Sets

Tuples

Consider a nonnegative integer n.
An ***n-tuple***, or ***tuple*** of ***length*** n, is a collection of n objects where order and multiplicity have significance.

(u) is a 1-tuple, (0,1) is a 2-tuple, (Pascal,©,Guelph) is a 3-tuple.
We have (0,1)≠(1,0) and (0,0,1)≠(0,1).

The objects in a tuple are the ***terms*** of the tuple.

The first term of ((x,y),z) is (x,y) and the second term is z.

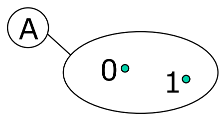
The 0-tuple is the ***empty tuple***; a 1-tuple is a ***singleton***; a 2-tuple is a ***pair***; a 3-tuple is a ***triple***; etc.

() is the empty tuple, (u) is a singleton, (0,1) is a pair.

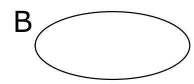
Sets 3

***set**:* a collection of objects; order and multiplicity have NO significance.

A={0,1}={1,0}={0,1,0,0,1}, B={0,1,2,3,…,99}, C={1,1/2,1/3,1/4,…}
D={(0,1),3.1,Dumbo,B}≠((0,1),3.1,Dumbo,B)



Venn diagrams



The objects in a set are called the ***elements*** of the set.
The notation $e \in S$ (or $S \ni e$) denotes that e is an element of the set S
(read "e is an element of S" or "e belongs to S" or "S contains e").

$0 \in A$, $2 \notin A$, $A \notin B$, $78 \in B$, $0.125 \in C$, $B \in D$, $0 \notin D$, $\{\} \notin A$, $\{\} \notin \{\}$, $\{\} \in \{\{\}\}$

The set with no elements is the ***empty set***; it is denoted by {} or $\emptyset$.
A set with exactly one element is a ***singleton*** (***set***);
a set with two elements is a ***pair*** (***set***); etc.

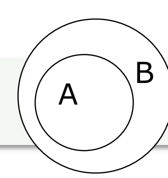
Subsets and Supersets 4

Let A and B be two sets.

We say that A is a ***subset*** of B
(or that A is included in B; B includes A; B is a ***superset*** of A)
and we write $A \subseteq B$ (or $B \supseteq A$),
iff every element of A is also an element of B.

We say that A is a ***proper subset*** of B
(or that B is a ***proper superset*** of A),
and we write $A \subset B$ (or $B \supset A$),
iff $A \subseteq B$ and $A \neq B$.

A={0,1}, B={0,1,2,3,…,99}, D={Pascal,Dumbo,3.1,B}
$A \subseteq A$, $A \not\subset A$, $A \subseteq B$, $A \subset B$, $B \not\subset D$, $\emptyset \subseteq \{\}$, $\{\} \subset A$



Cartesian Product

Let A and B be sets.
The ***Cartesian product*** of A and B, denoted by AxB,
is the set of all pairs (a,b) where a∈A and b∈B.
AxA is also denoted by A^2.

Let A, B, C be sets.
The ***Cartesian product*** of A, B, C, denoted by AxBxC,
is the set of all triples (a,b,c) where a∈A, b∈B, c∈C.
AxAxA is also denoted by A^3.

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{0,1}x{}={}, $\{0,1\}^2$={(0,0),(0,1),(1,0),(1,1)},
{0,1}x{u,v,w}={(0,u),(0,v),(0,w),(1,u),(1,v),(1,w)}

Prof. Matsakis A Review of Tuples and Sets

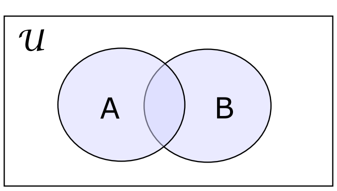
Union, Intersection, Difference

Let $\mathcal{U}$ be the ***universal set*** (any nonempty set),
and let A and B be two sets (i.e., two subsets of $\mathcal{U}$).

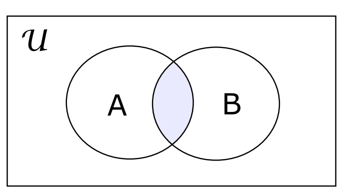
The ***union*** of the sets A and B is the set of the elements of $\mathcal{U}$
that belong to A or B. It is denoted by A∪B.

The ***intersection*** of A and B is the set of the elements of $\mathcal{U}$
that belong to A and B. It is denoted by A∩B.
If A∩B={}, then A and B are ***disjoint***; otherwise, they ***overlap***.

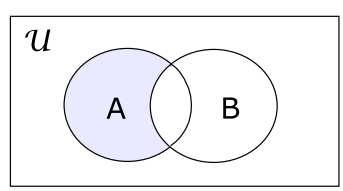
The ***difference*** of A and B is the set of the elements of $\mathcal{U}$
that belong to A but do not belong to B. It is denoted by A−B.



A∪B



A∩B



A−B

Common Number Sets

$\mathbb{N}$ is the set $\{0,1,2,\ldots\}$ of natural numbers.
$\mathbb{Z}$ is the set $\{\ldots,-2,-1,0,1,2,\ldots\}$ of integers.
$\mathbb{Z}^+$ is the set $\{1,2,3,\ldots\}$ of positive integers.
$\mathbb{R}$ is the set of real numbers.
$\mathbb{R}^-$ is the set of negative real numbers.
$\mathbb{R}^*$ is the set of nonzero real numbers.
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Integer Intervals

Let m and n be two integers.

m..n is the set of all the integers
that are greater than or equal to m and less than or equal to n.

m..+∞ is the set of all the integers
that are greater than or equal to m.

−∞..n is the set of all the integers
that are less than or equal to n.

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$0..9 = \{0,1,2,3,4,5,6,7,8,9\}$
$-\infty..+\infty = \mathbb{Z}$
$1..+\infty = \mathbb{Z}^+$

Real Intervals

Let u and v be two real numbers.

[u,v] is the set of all the real numbers
that are greater than or equal to u and less than or equal to v.

]u,v[is the set of all the real numbers
that are greater than u and less than v.

[u,v[is the set of all the real numbers
that are greater than or equal to u and less than v.

[u,+∞[is the set of all the real numbers
that are greater than or equal to u.

]−∞,v[is the set of all the real numbers
that are less than v.

$]-\infty,0[\ = \mathbb{R}^-$
$[4,4]=\{4\}$
$[4,4[=\varnothing$

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END