

## $n$ -Ary Relations

An  $n$ -ary relation on  $A_1, A_2, \dots, A_n$  is a subset of  $A_1 \times A_2 \times \dots \times A_n$ .

The sets  $A_1, A_2, \dots, A_n$  are called *domains*.  $n$  is called the *degree*.

If  $P(x_1, x_2, \dots, x_n)$  is a predicate, then  $\{(a_1, a_2, \dots, a_n) \mid P(a_1, a_2, \dots, a_n) \text{ is true}\}$  is an  $n$ -ary relation.

If  $f(a_1, a_2, \dots, a_{n-1}) = a_n$  is a function, then  $\{(a_1, a_2, \dots, a_n) \mid f(a_1, a_2, \dots, a_{n-1}) = a_n\}$  is an  $n$ -ary relation.

### More Examples of $n$ -Ary Relations

Predicates: `isspace(c)`,  
`bsearch(key, base, n, size, cmp)`

Functions: `pow(x, y)`, `div(num, denom)`

Any array of structures with  $n$  members/structure.

System files:

`/etc/passwd`, `/etc/fstab`, `/etc/mtab`

Miscellaneous: truth tables, matrices, grade file.

## Relational Databases

Relational databases consist of  $n$ -ary relations. A *table* corresponds to an  $n$ -ary relation. A *record* corresponds to an element. A *field* corresponds to a domain.

There are three important operations.

1. Select. Find the records in a table that satisfies some condition, creating a table with fewer records.
2. Project. Choose a subset of the fields, creating a table with fewer fields.
3. Join. Create a new table from two other tables. If a record from table 1 and a record from table 2 have identical value(s) for certain field(s), then the two records are combined to create a new record.

---

H1	H2	H3	M1	H4	H5	H6	M2
110	68	115	87	80	90	81	98
86	95	120	96	100	98	70	95
00	85	120	91	100	00	78	95
115	81	95	77	95	83	91	95
65	56	65	81	85	73	78	91
110	95	120	97	100	89	94	90
85	100	80	90	70	93	95	88
100	56	65	81	88	00	00	88
88	80	80	98	100	75	60	81
50	90	90	88	60	65	80	81