[1, 3, -77, 24, - - - -]

1000

[-24, 1, 3, 24 . . . 100]

250

500

$$\{\underset{a}{5},\ \underset{b}{3},\ \underset{c}{-3},\ \underset{d}{-2}\}$$

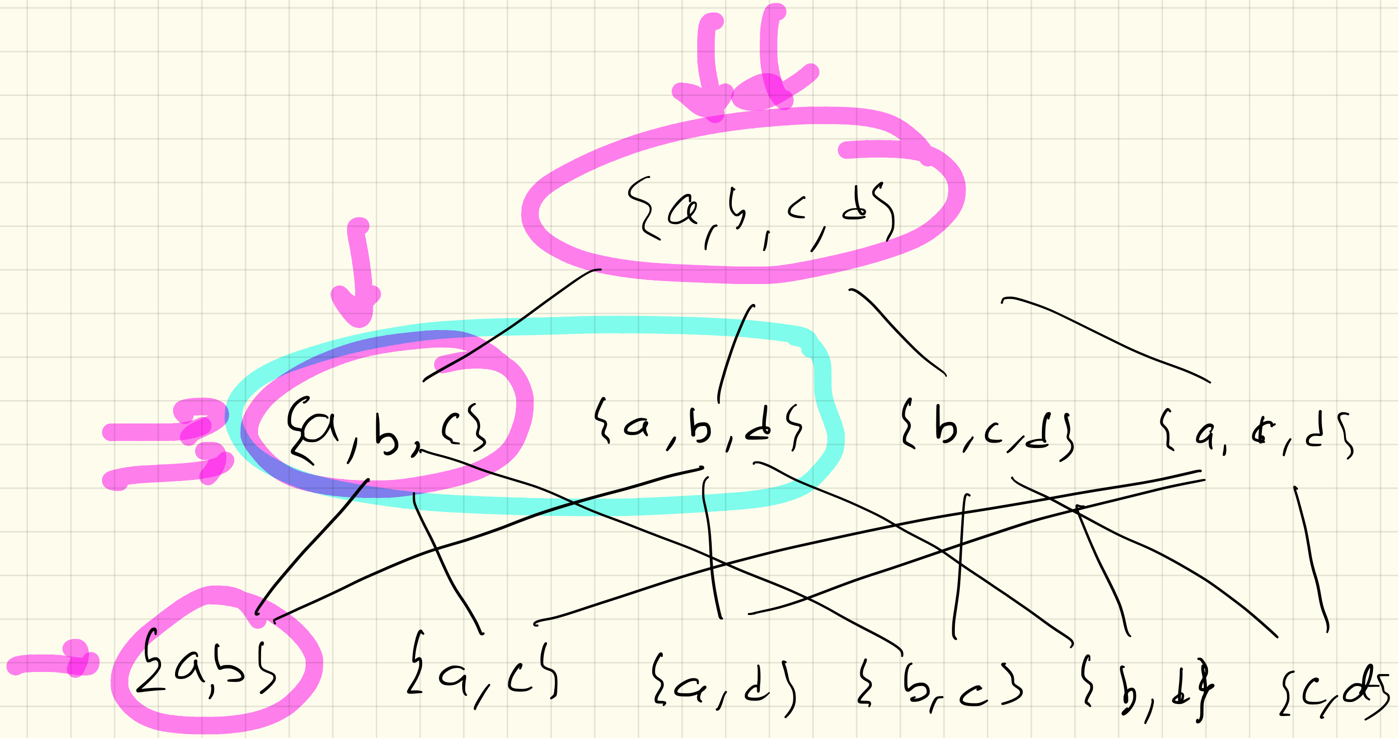
$$\{3, -3\}$$

$$\{5, -3, -2\}$$

$$A = \{\, X \mid \underline{X \subseteq \{a, b, c, d\}},\ |X| \geq 2 \,\}$$

$X, Y \in A$ $\qquad$ $X \prec Y$ if $X \subseteq Y$

$A = \{ X \mid X \subseteq \{a, b, c, d\}, \ |X| \geq 2 \}$



Definition A binary relation R on a set A is a total order if it is a partial order such that for any $x, y \in A$, xRy or yRx.

The Hasse diagram of a total order is a chain.

Examples

- the relation $\leq$ on the set $\mathbb{R}$ of real numbers;
- the usual lexicographical ordering on the words in a dictionary;
- the relation "is a divisor of" is *not* a total order.

n-ary relations

The Cartesian product $A_1 \times A_2 \times \cdots \times A_n$ of sets $A_1, A_2, \ldots, A_n$ is defined by

$$A_1 \times A_2 \times \cdots \times A_n = \{(a_1, \ldots, a_n) \mid a_1 \in A_1, \ldots, a_n \in A_n\}.$$

Here $(a_1, \ldots, a_n) = (b_1, \ldots, b_n)$ if and only if $a_i = b_i$ for all $1 \leq i \leq n$.

An *n-ary relation* is a subset of $A_1 \times \ldots \ldots A_n$

A database table $\approx$ relation

TABLE 1 Students.

Student_name	*ID_number*	*Major*	*GPA*
Ackermann	231455	Computer Science	3.88
Adams	888323	Physics	3.45
Chou	102147	Computer Science	3.49
Goodfriend	453876	Mathematics	3.45
Rao	678543	Mathematics	3.90
Stevens	786576	Psychology	2.99

Students = { (A.., 231455, CS, 3.88),

⋮

}

Unary relations

Unary relations are just subsets of a set.

Example: The unary relation `EvenPositiveIntegers` on the set $\mathbb{Z}^+$ of positive integers is

$$\{x \in \mathbb{Z}^+ \mid x \text{ is even}\}.$$

Unary relations are just subsets of a set.

Example: The unary relation `EvenPositiveIntegers` on the set $\mathbb{Z}^+$ of positive integers is

$$\{x \in \mathbb{Z}^+ \mid x \text{ is even}\}.$$

Unary relations are just subsets of a set.

Example: The unary relation `EvenPositiveIntegers` on the set $\mathbb{Z}^+$ of positive integers is

$$\{x \in \mathbb{Z}^+ \mid x \text{ is even}\}.$$