Knowledge Structure on properties of relations

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Knowledge Domain

Each subset R $\subseteq A \times A$ is called a binary relation. They can have several properties of interest in quantitative psychology.
We considered:

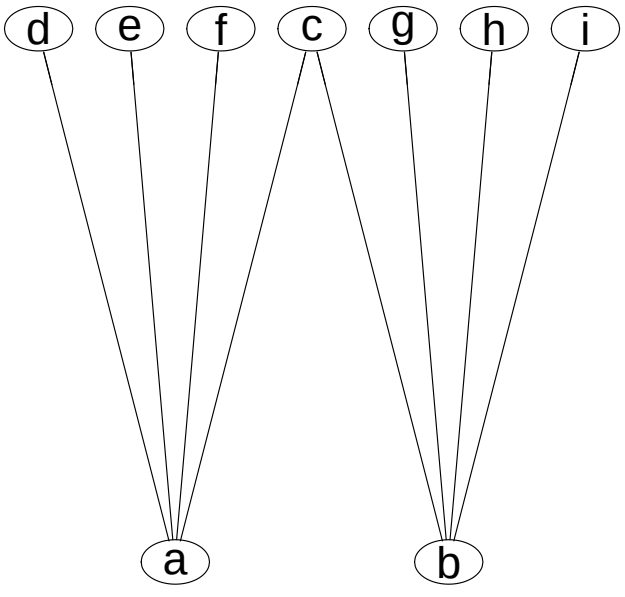
1. Symmetry
$$\forall\ a, b \in A : aRb \implies bRa$$

2. Asymmetry
$$\forall\ a, b \in A : aRb \implies b\overline{R}a$$

3. Antisymmetry
$$\forall\ a, b \in A : (aRb \wedge bRa) \implies a = b$$

Skills

a. Master matrices
b. Master set-theoretical notations
c. Understand the relationship between matrix notations and set-theoretical notations
d. Apply the definition of symmetry to a matrix
e. Apply the definition of asymmetry to a matrix
f. Apply the definition of antisymmetry to a matrix
g. Check a set-theoretical notation of a relation for symmetry
h. Check a set-theoretical notation of a relation for asymmetry
i. Check a set-theoretical notation of a relation for antisymmetry



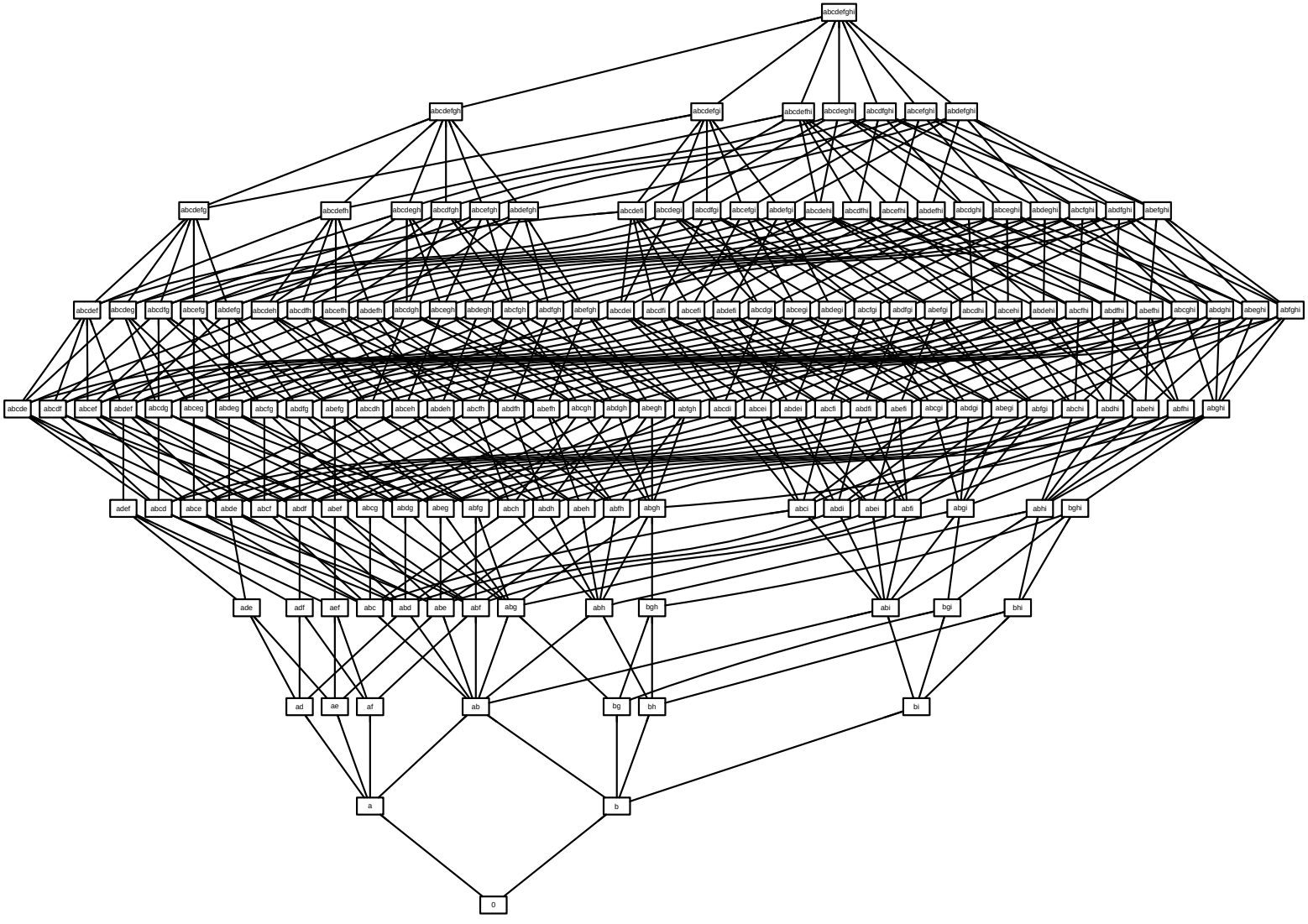
Skillmap (conjunctive model)

Task (Q)	Skills (S)	Task	Skills	Task	Skills
1	{a}	7	{b, g}	13	{a, d, e, f}
2	{b}	8	{b, h}	14	{b, g, h, i}
3	{a, b, c}	9	{b, i}	15	{a, b, c, g}
4	{a, d}	10	{a, b, c, d}	16	{a, b, c, h}
5	{a, e}	11	{a, b, c, e}	17	{a, b, c, i}
6	{a, f}	12	{a, b, c, f}		

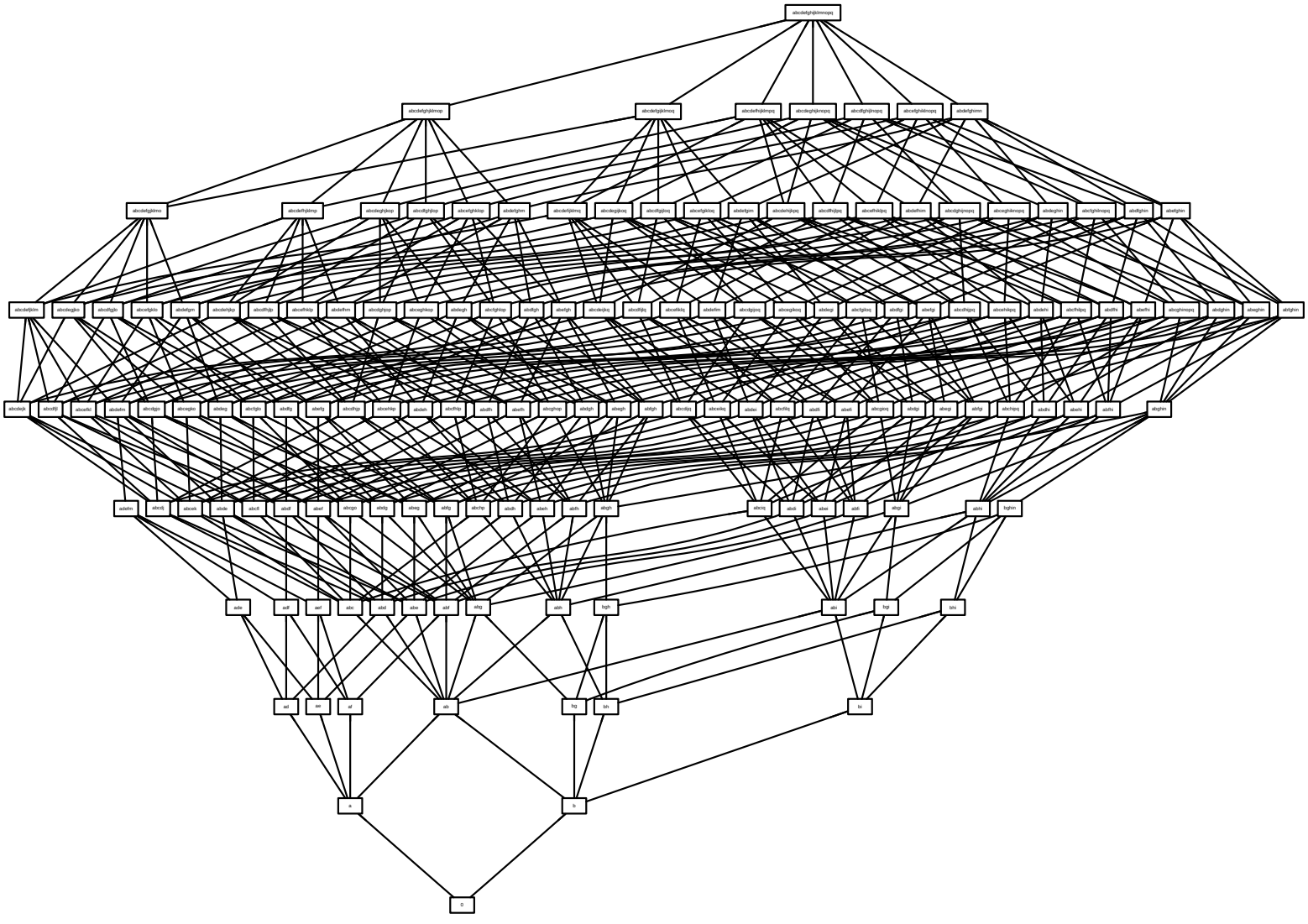
The problem function $p : 2^S \mapsto 2^Q$ is injective: a unique set of skills is assigned to every response pattern.

That is why the Competence Space and the Knowledge Structure (depicted on the following slides) are isomorphic.

Quasi-ordinal Competence Space



Well-graded Knowledge Structure: 145 Knowledge States



Thanks!