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Formal Concept Analysis
Exercise Sheet 1, Winter Semester 2015/16

1 Set Theory

Exercise 1 (Recapitulation)

Given the following hints and the universe $M := \{1, 2, 3, 4, 5, 6, 7, 8\}$, compute the sets A, B, C:

(*a*) $A \cup B = \{2, 3, 4, 5, 6, 7, 8\}$

(*b*) $B \cup C = \{1, 2, 4, 6, 8\}$

(*c*) $A \cup C = \{1, 2, 3, 4, 5, 7, 8\}$

(*d*) $A \cap B = \{2\}$

(*e*) $B \cap C = \{2, 4, 8\}$

(*f*) $A \cap C = \{2\}$

2 Logic

Exercise 2 (repetition first-order logic)

Formalize the following statements for natural numbers a, b, c:

(*i*) a divides b.
(*ii*) a is odd.
(*iii*) a is common divisor of b and c
(*iv*) a is the gcd of b and c.
(*v*) a is a square number.
(*vi*) a is a prime number.

3 Order Theory

Exercise 3

A (partial) order is a binary relation $\leq$ over a set P which is reflexive, antisymmetric and transitive. i.e., $\forall a, b, c \in P$:

- $a \leq a$ (reflexivity);
- if $a \leq b$ and $b \leq a$ then $a = b$ (antisymmetry);
- if $a \leq b$ and $b \leq c$ then $a \leq c$ (transitivity).

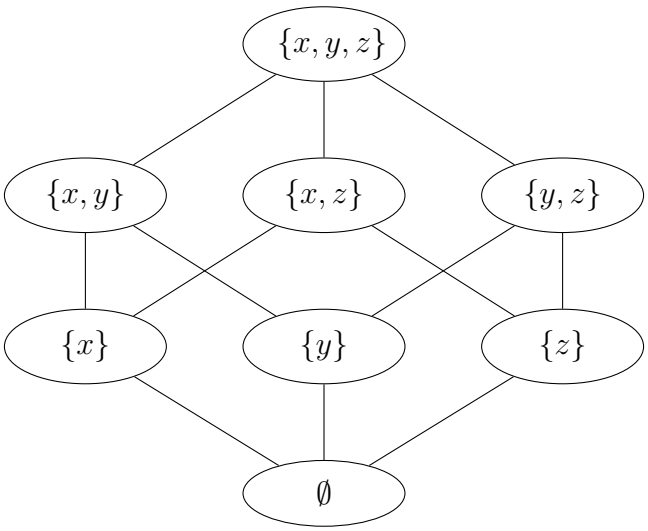

Figure 1: The line diagram of the partially ordered set $\mathcal{P}(\{x, y, z\})$.

A set together with a (partial) order is called a (partially) ordered set (poset).

Given a set $A = \{x, y, z\}$, the powerset of A, $\mathcal{P}(A) = \{\emptyset, \{x\}, \{y\}, \{z\}, \{x, y\}, \{x, z\}, \{y, z\}, \{x, y, z\}\}$ is a poset under $\subseteq$, the subset relation. The line diagram in Figure 1 shows the order.

a) Give two examples of ordered sets – one finite set and one infinite set.

b) There are – up to isomorphy – exactly 24 ordered sets with at least one and at most four elements. Draw a diagram for each isomorphism class (= each ordered set)!

c) Draw a line diagram of the ordered set $T(60)$: the elements are the divisors of 60, the order is the divisibility. What can you observe?

4 Concept

Exercise 4 (Recapitulation)

In small groups of 2-3 students, discuss your understanding of a concept from the reading references provided in the last lecture.

- `http://www.alleydog.com/glossary/definition.php?term=Concept`
- `http://general-psychology.weebly.com/how-are-concepts-formed.html`
- Walter Edelmann Lernpsychologie, 6. Auflage, 2000. Kapitel 4.2 (Seiten 116-130, insbesondere Kapitel 4.2.1 zu "Eigenschaftsbegriffen" und "klassischer Theorie")