Inleveropgave 1

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1. Four elements of $P(\{a,b,c\})$ contain the element a, namely $\{\{a\},\{a,b\},\{a,c\},\{a,b,c\}\}$.

2. This question can be divided into three parts:

   – $X \in P(P(X))$ does not hold. Suppose for example that $X = \{a\}$. We can see that $P(P(X)) = \{\{\{a\},\emptyset\},\{\{a\}\},\{\emptyset\},\emptyset\}$, and $\{a\} \notin P(P(X))$ (this is a counter-example).

   – $\emptyset \in P(P(X))$ holds iff $\emptyset \subseteq P(X)$. We know the latter is always true, because the empty set is a subset of every set.

   – If X has n elements, $P(P(X))$ has 2^{2^n} elements.

3. First, we can see that $|A \times B| = |A| \times |B|$. This question can be divided into two parts:

   – If $|A \times B| = 1$, and thus $|A| \times |B| = 1$, it must mean that $|A| = 1$ and $|B| = 1$.

   – If $|A \times B| = 0$, and thus $|A| \times |B| = 0$, it must mean that $|A| = 0$ or $|B| = 0$.

4. $X \backslash Y = X \iff X \cap Y = \emptyset$. We will informally explain why this is so. The set $X \backslash Y$ is the set of elements that are in X but not in Y. If this set must equal X, we must conclude that there are no elements in both X and Y. In other words: the intersection must be empty.