Axiom 1. A *set* can be queried for containment of other objects. In other words, if S is a set and x is any object, then the sentence "x is in S." is either true or false. The sentence "x is in S" is also written "$x \in S$".

If $x_1, \ldots, x_n$ are objects then there is a set $S = \{x_1, \ldots, x_n\}$ such that $x \in S$ if and only if $x = x_i$ for some index i (with $1 \leq i \leq n$).

If S is a set and $P(x)$ is a property depending on an object x then there is another set T such that $x \in T$ if and only if $x \in S$ and $P(x)$ is true.

Definition 2. We say that two sets S and T are *equal* if every object that is in S is also in T and every object that is in T is also in S. In other words, $S = T$ if, for every object x,

$$(x \in S) \iff (x \in T).$$

Problem 3. How many distinct sets are listed below?

$$\varnothing, \{\varnothing\}, \{\{\varnothing\}\}, \{\,\}, \{\{\varnothing\}, \{\varnothing\}\}$$

A) 1 B) 2 C) 3 D) 4 E) 5

Solution. C) □

Problem 4. How many distinct sets are listed below?

$$\{\varnothing, \{\varnothing\}, \{\{\varnothing\}\}, \{\,\}, \{\{\varnothing\}, \{\varnothing\}\}\}$$

A) 1 B) 2 C) 3 D) 4 E) 5

Solution. A) □

Problem 5. For any $x_1, \ldots, x_n$ and $y_1, \ldots, y_m$, if

$$\{x_1, \ldots, x_n\} = \{y_1, \ldots, y_m\}$$

then $n = m$.

A) True B) False

Problem 6. What is the cardinality of the set below?

$$\{x \in \mathbb{Z} \,:\, 0 \leq x^2 \leq 50\}$$

A) 1 B) 8 C) 10 D) 15 E) Infinite

Solution. D) □