

Problems to be solved in tutorials

Week 1 (Sets, set operations, relations, equivalence relations)

Problem 1. List the elements in each of the following sets:

- (a) $\{x \in R \mid x^2 = 5\}$
- (b) $\{a \in N \mid a < -4 \text{ and } a > 4\}$
- (c) $\{n \in N \mid n^2 + n \text{ is a multiple of } 3\}$

Problem 2. Represent the set $\{-10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10\}$ by common property of its elements.

Problem 3. Given the set $S = \{\clubsuit, \diamond, \heartsuit, \spadesuit\}$,

- (a) Find $P(S)$.
- (b) Determine the number of elements in $P(P(S))$, where $P(\cdot)$ stands for the power set.
- (c) Make sure whether $P(S) \subseteq P(P(S))$.

Problem 4. Let $A = \{x \in N \mid x < 7\}$, $B = \{x \in Z \mid |x - 2| < 4\}$ and $C = \{x \in R \mid x^3 - 4x = 0\}$. Find $A \cup C$, $B \cap C$, $B - C$, $A \oplus B$, $(A - B) - C$, $A - (B - C)$, $(B \cup \emptyset) \cap \emptyset$.

Problem 5. Use Venn diagrams method to prove the second law of De Morgan: $(A \cap B)^C = A^C \cup B^C$.

Problem 6. Determine which of the properties reflexive, symmetric, antisymmetric and transitive is applied to {is a relative of} relation on the set of people. Take the question for {is a friend of} relation.

Problem 7. Check whether {is of the same suit} relation on the set of 52 playing cards is equivalence relation. If it is so, determine equivalence classes.