

Discrete Structures

Fight for Survival

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Some Practice Problems

P1: $(A \oplus B) \oplus B = ?$

P2: $A_i = \{1, 2, 3, \dots, i\}$, compute $\cup_{i=1}^n A_i, \cap_{i=1}^n A_i$

P3: Let R be on $\mathbb{Z}^+ \times \mathbb{Z}^+$ such that $((a, b), (c, d)) \in R$ if $a + d = b + c$. Is R an equivalence?

P4: Write the following statement in formal language?

There exist two nonempty disjoint sets.



P5: Write the following statement in formal language?

There exist exactly two nonempty disjoint sets.



P6: Write the following statement in formal language?

There exist three pairwise overlapping sets.

P7: Write the following statement in formal language?

There exist three pairwise overlapping sets that mutually disjoint.

P8: Prove/Disprove: $\nexists n \in \mathbb{Z}^+, n^2 + n^3 + n^4 = 100$



P9: Give a nonempty poset that has a minimal element but no maximal element.

P10: Give a nonempty poset that has neither a maximal nor a minimal element.



P11: Given two posets, $(S, \preceq_1)$, and $(S, \preceq_2)$, show that $(S \times T, \preceq)$ is a poset where $(s, t) \preceq (u, v)$ iff $(s \preceq_1 u) \wedge (t \preceq_2 v)$.

P12: Which of these are partitions of the set $\mathbb{Z} \times \mathbb{Z}$?

- a) The set of pairs (x, y) , where x or y is odd; The set of pairs (x, y) , where x is even; The set of pairs (x, y) , where y is even.

P12: Which of these are partitions of the set $\mathbb{Z} \times \mathbb{Z}$?

- b) The set of pairs (x, y) , where both x and y are odd; The set of pairs (x, y) , where exactly one of x and y is odd; The set of pairs (x, y) , where both x and y are even.

P12: Which of these are partitions of the set $\mathbb{Z} \times \mathbb{Z}$?

- c) The set of pairs (x, y) , where x is positive; The set of pairs (x, y) , where y is positive; The set of pairs (x, y) , where both x and y are negative.

P12: Which of these are partitions of the set $\mathbb{Z} \times \mathbb{Z}$?

- d) The set of pairs (x, y) , where $3|x$ and $3|y$; The set of pairs (x, y) , where $3|x$ and $3 \nmid y$; The set of pairs (x, y) , where $3 \nmid x$ and $3|y$; The set of pairs (x, y) , where $3 \nmid x$ and $3 \nmid y$.

P12: Which of these are partitions of the set $\mathbb{Z} \times \mathbb{Z}$?

- e) The set of pairs (x, y) , where $x > 0$ and $y > 0$; The set of pairs (x, y) , where $x > 0$ and $y \leq 0$; The set of pairs (x, y) , where $x \leq 0$ and $y > 0$; The set of pairs (x, y) , where $x \leq 0$ and $y \leq 0$.

P12: Which of these are partitions of the set $\mathbb{Z} \times \mathbb{Z}$?

f) The set of pairs (x, y) , where $x \neq 0$ and $y \neq 0$; The set of pairs (x, y) , where $x = 0$ and $y \neq 0$; The set of pairs (x, y) , where $x \neq 0$ and $y = 0$.