

Discrete Mathematics and Applications

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Hanoi 2012

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1 Assignment No. 3: sets

Due: Tuesday, Oct. 2

Please submit your answer in a neat, readable properly organized format.

1. Draw the Venn digram for the the following combination of four sets:

(a) $A \setminus (B \cap C \cap D)$

(b) $\overline{(A \cap B) \cup (C \cap D)}$

(c) $(\overline{A} \cup \overline{B}) \cap (\overline{C} \cup \overline{D})$

2. (a) Let $A_k = \{x \mid x = 4i + 1, i = 0, \dots, k\}$

(b) Let $B_k = \{y \mid y \text{ is prime, } y \leq k\}$

(c) Let $C = \{z \mid z = a^2 + b^2, z \leq k\}$

(d) What is $A_{100} \cap B_{100}$

(e) What is $A_{100} \cap C_{100}$

(f) What is $A_{1000} \cap B_{1000} \cap C_{1000}$

(g) Our class has 40 students. How many teams of students can you form if each team has an even number of students and any two teams have an even number of students in common.

(h) How many teams can you form if each two teams have an odd number of students and any two teams have an even number of students in common.

(i) how many teams can you form if no team is a subset of a different team

Challenge: use the logicsim program to design a circuit with five inputs and two outputs such that the first output will be TRUE (and the second will be FALSE) only when exactly 0,2 or 4 inputs are TRUE while if 1, 3 or 5 are TRUE then the second output will be TRUE and the first will be FALSE.

2 SAGE exercise

Let $An = n(n + 1)(n + 2) \dots (n + 7)$. Let $D_n = \{|a - b| \mid a * b = n\}$.

- (a) Randomly select 10 different values for n in the range $100 \dots 500$.
- (b) For each n find $\min(D_n)$.
- (c) Can you identify any pattern?
- (d) Can you form an hypothesis?