Discrete Mathematics and Applications

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1 Assignment No. 3: Sets

Due: Thursday, 29 Sep.

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

1. In the Venn diagram for 4 sets A, B, C, D mark the following subsets:

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

2. Let $A_n = \{i \mid n \le i \le 2n\}$ $i \in Z^+$ Find: $\bigcup_{n=1}^{100} A_n$. Find $\bigcap_{n=1}^{k} A_n$.

3. We have 36 students in our class.

   - How many different teams of 3 students can we form?
   - How many different teams with an even number of students can we form?
   - How many different teams with an even number of students such that every two teams have an even number of students in common can be formed.
   - * How many teams can we have if no team is a subset of another team.

4. Can you find an integer n such that $n^2 \bmod 111 = 5$, $n^3 \bmod 17 = 50$, and $n \bmod 23 = 14$ (Use SAGE)

2 Functions exercises

1. In the enumeration used in class for NxN in what location will be the pair $(95, 32)$.
   What pair will be in location 2011?

2. a. If f *and* $f \circ g$ are ONTO does it follow that g is ONTO?

   b. If f *and* $f \circ g$ are $1 - 1$ does it follow that g is $1 - 1$?

3. Show that the function $f : Z^+ \times Z^+ \to Z^+$ defined by: $\frac{(m+n-2)(m+n-1)}{2} + m$ is a bijection.