Relations

Q1. Given $R_1 = \{(1,2), (2,3), (3,3), (3,2)\}$ and $R_2 = \{(1,1), (2,2), (3,3), (1,3)\}$ calculate

ⓐ $R_1 \cap R_2$

ⓑ $R_1 - R_2$

ⓒ $R_2 - R_1$

ⓓ Consider R_1, R_2 are relations on the set $A = \{1,2,3\}$. Identify if R_1, R_2 are reflexive/symmetric/transitive/Anti-symmetric

Q2. Consider R_1 and R_2 are relations on the set A, represented by relational matrices

$$M_{R1} = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix} \qquad M_{R2} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

Calculate: ⓐ $M_{R1 \cup R2}$ ⓑ $M_{R1 - R2}$ ⓒ $M_{R2 \circ R1}$

Q3. Suppose R and S are reflexive relation on the set A. Prove that their intersection $R \cap S$ is reflexive as well.

Q4. Consider that R is a symmetric relation on the set A. Prove that R^n is also symmetric $\forall n \in \mathbb{N}$.

Permutations & combinations

Q1. Consider the word STATISTICS, and count the distinct permutations that have "S" at the beginning and end.

Q2. Suppose you are the member of NSU football team. You play 15 games in a season. Calculate the number of ways your team finishes the season with 8 wins, 6 losses and 1 tie.

Q3. Consider that you have 12 different physics book and 9 mathematics book (different). How many different arrangement of all the books are possible where no two mathematics books are placed together?

Q4. How many permutations are possible with letters ABCDEFG with A is not at the beginning and H is not at the end of string.

Q5. Suppose in your classroom there are 50 students and 50 seats. The front row has 10 seats and there are 8 students in the class who must take seats in the first row. How many seating arrangements are possible for the students that assure 8 places for those 8 students?