

Discrete Mathematics, Tutorial III

1. Let A and B be arbitrary sets. Show that if $A \cap C \subseteq B \cap C$ for all sets C , then $A \subseteq B$.
2. Let A , B , and C be arbitrary sets. Prove or disprove: If, for all x , $x \in A \rightarrow (x \in B \rightarrow x \in C)$ is true, then $(A \cap B) \subseteq C$.
3. How many relations are there on a set with n elements that are:
 - (a) symmetric?
 - (b) antisymmetric?
 - (c) asymmetric?
 - (d) irreflexive?
 - (e) reflexive and symmetric?
 - (f) neither reflexive nor irreflexive?
4. Let S be a set with n elements.
 - (a) How many relations on S are symmetric, antisymmetric, and reflexive?
 - (b) How many relations on S are symmetric, antisymmetric, and irreflexive?
 - (c) How many relations on S are symmetric and antisymmetric?
5. Let G be an undirected graph with n vertices on which the adjacency relation is transitive: whenever there is an edge uv and an edge vw , there is also an edge uw , for every distinct nodes u, v and w . Suppose further that G is connected. How many edges does G have?