CS1231 Review 16

1. **Product Rule**

   Suppose an operation can be broken down into a sequence of 2 steps. If the first step can be done in r ways and the second step can be done in s ways (regardless of how the first step was done), then the entire operation can be performed in rs ways.

2. **Sum Rule**

   If the number of objects with property 1 is m and the number of objects with property 2 is n and there are no objects with both property 1 and 2, the total number of objects is $m+n$

3. **Difference Rule**

   Suppose there are m objects with properties 1 and 2 and there are n objects with property 2. Then the number of objects with property 1 but not property 2 is $m-n$.

4. **Inclusion/Exclusion Rule**

   Let A, B, C be finite sets. Then

   - $|A \cup B| = |A| + |B| - |A \cap B|$
   - $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$

5. A **permutation** of a set of distinct objects is an ordering of the objects.

   The number of permutation of n distinct objects is $n!$.

6. More generally, an r**-permutation** of a set of n distinct objects is an ordering of r elements from the set.

   

   The number of r-permutation of a set of n distinct objects is denoted $P(n,r)$. It is equal to $\frac{n!}{(n-r)!}$.

7. Let n, r be integers with $0 \leq r \leq n$. An r-**combination** of a set of n (distinct) objects is a subset of r objects.

   The number of r-combination of a set of n distinct objects is denoted $\binom{n}{r}$. It is equal to $\frac{n!}{r!(n-r)!}$. $= \binom{n}{n-r}$