HW p. 111: 1 - 4, 7, 16, 17, 18; p. 40: 19; and

Chapter 2 Basic Counting

2.1 Product Rule: If $S = S_1 \times S_2$, then $|S| = |S_1||S_2|$.

$x = (a, b) \in S$ implies $a \in S_1$ AND $b \in S_2$, then $|S| = |S_1||S_2|$.

How many sequences consisting of one letter followed by one single digit number (0 - 9) are possible?

How many different license plates are possible if 3 letters followed by 3 numbers are used?

How many different DNA sequences of length 2?

How many different DNA sequences of length 3?

2.6 Subsets

Suppose a set A has four elements (i.e., the cardinality of $A = |A| = 4$)

The number of subsets of A is

The number of nonempty subsets of A is

Suppose we know proteins A, B, C, D affect a particular biological reaction. How many different experiments can be performed in order to analyze the effects of these proteins on the biological reaction?

A pizza parlor offers 4 different toppings (sausage, onions, chicken, walnuts). How many different types of pizzas can one order?

Suppose a set B has n elements (i.e., $|B| = n$). The number of subsets of B is

2.2 Sum Rule: If $S = S_1 \cup S_2$ and $S_1 \cap S_2 = \emptyset$, then $|S| = |S_1| + |S_2|$.

If $S_1 \cap S_2 = \emptyset$ and if $x \in S$ implies $x \in S_1$ OR $x \in S_2$, then $|S| = |S_1| + |S_2|$.

Suppose a symbol can be either a number between 0 and 9 or a letter. How many are symbols there?

How many even numbers between 100 and 1000 have distinct digits.

2.3, 2.5 Permutations and r-permutations:

Suppose $|S| = n$.

An *r-permutation* of S is an ordered arrangement of r of the n elements of S.

If $r = n$, then an r-permutation of S is a *permutation* of S.

$P(n, r) =$ number of r-permutations of S where $|S| = n$.

4 TA's need to be assigned to 4 different classes. How many different possible assignments are there?

4 classes need to be assigned a TA. There are 10 TAs. How many different possible assignments are there?

Defn: $n! = n(n-1)(n-2)...(2)(1), \;\; 0! = 1$

Thm 3.2.1: If $r > n$, then $P(n, r) = 0$.
If $r \leq n$, then $P(n, r) = \frac{n!}{(n-r)!}$

$P(0, 0) =$ $\qquad P(n, 0) =$ $\qquad P(n, 1) =$ $\qquad P(n, n) =$

2.7 r-Combinations

An *r-combination* of S is an r-element subset of S (ORDER DOES NOT MATTER).

$C(n,r)$ = number of r-combinations of S where $|S| = n$.

How many different math teams consisting of 4 people can be formed if there are 10 students from which to choose?

Thm: $C(n,r) = \binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{P(n,r)}{r!}$

Cor: $C(n,r) = C(n, n-r)$

Cor: $C(n,r) = C(n-1, r-1) + C(n-1, r)$

Cor: Pascal's Triangle.

Cor: $\Sigma_{i=0}^{n} \binom{n}{i} = 2^n$

How many different proteins containing 10 amino acids can be formed if the protein contains 5 alanines(A), 3 leucines (L), and 2 serines (S)?