

Actuarial Science  
Probability  
Problem Set 3  
Counting and Combinatorics:  
The Fundamental Principle of Counting

1. If each of the 10 digits is chosen at random, how many ways can you choose the following numbers?
  - (a) A two-digit code number, repeated digits permitted.
  - (b) A three-digit identification card number, for which the first digit cannot be a 0.
  - (c) A four-digit bicycle lock number, which no digit can be used twice.
  - (d) A five-digit zip code number, with the first-digit not zero.
2.
  - (a) If eight horses are entered in a race and three finishing places are considered, how many finishing orders can they finish? Assume no ties.
  - (b) If the top three horses are Lucky One, Lucky Two, and Lucky Three, in how many possible orders can they finish?
3. You are taking 3 shirts (red, blue, yellow) and 2 pairs of pants (tan, gray) on a trip. How many different choices of outfits do you have?
4. A club has 10 members. In how many ways can the club choose a president and a vice-president if everyone is eligible?
5. In a medical study, patients are classified according to whether they have blood type A, B, AB, or O, and also according to whether their

blood pressure is low (L), normal (N), or high (H). Use a tree diagram to represent the various outcomes that can occur.

6. If a travel agency offers special weekend trips to 12 different cities, by air, rail, or bus, in how many different ways can such a trip be arranged?
7. If twenty paintings are entered in an art show, in how many ways can the judges award a first prize and a second prize?
8. In how many ways can the 52 members of a labor union choose a president, a vice-president, a secretary, and a treasurer?
9. Find the number of ways in which four of ten new movies can be ranked first, second, third, and fourth according to their attendance figures for the first six months.
10. How many ways are there to seat 10 people, consisting of 5 couples, in a row of seats (10 seats wide) if all couples are to get adjacent seats?