

## MM 212 (Probability and statistics )

### Practice Problem Set - 1 (Analysis of Combinatorics)

**Instructor:** Dharmendra Kumar

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1. (a) How many different 7 place license plates are possible if the first 2 places are for letters and the other 5 for numbers ?  
(b) Repeat part (a) under the assumption that no letter or number can be repeated in a single license plate.
2. How many different 7 place license plates are possible when 3 of the entries are letters and 4 are digits ? Assume that repetition of letters and numbers is allowed and that there is no restriction on where the letters or numbers can be placed.
3. Twenty workers are to be assigned to 20 different jobs, one to each job. How many different assignments are possible ?
4. (a) In how many ways can 3 boys and 3 girls sit in a row ?  
(b) In how many ways can 3 boys and 3 girls sit in a row if the boys and the girls are each to sit together ?  
(c) In how many ways if only the boys must sit together ?  
(d) In how many ways if no two people of the same sex are allowed to sit together ?
5. How many different letter arrangements can be made from the letters:  
(a) Fluke;  
(b) Propose;  
(c) Mississippi;  
(d) Arrange ?
6. How many different linear arrangements are there of the letters A, B, C, D, E and F for which  
(a) A and B are next to each other;  
(b) A is before B;  
(c) A is before B and B is before C;  
(d) A is before B and C is before D;  
(e) A and B are next to each other and C and D are also next to each other;  
(f) E is not last in line ?
7. If 4 Americans, 3 French people, and 3 British people are to be seated in a row, how many seating arrangements are possible when people of the same nationality must sit next to each other ?
8. A child has 12 blocks, of which 6 are black, 4 are red, 1 is white, and 1 is blue. If the child puts the blocks in a line, how many arrangements are possible ?
9. In how many ways can 8 people be seated in a row if  
(a) there are no restrictions on the seating arrangement;

- (b) persons A and B must sit next to each other;
  - (c) there are 4 men and 4 women and no 2 men or 2 women can sit next to each other;
  - (d) there are 5 men and they must sit next to one another;
  - (e) there are 4 married couples and each couple must sit together ?
10. In how many ways can 3 novels, 2 mathematics books, and 1 chemistry book be arranged on a bookshelf if
    - (a) the books can be arranged in any order;
    - (b) the mathematics books must be together and the novels must be together.
    - (c) The novels must be together, but the other books can be arranged in any order ?
  11. Consider a group of 20 people. If everyone shakes hands with everyone else, how many handshakes take place ?
  12. How many 5 card poker hands are there ?
  13. From a group of 8 women and 6 men, a committee consisting of 3 men and 3 women is to be formed. How many different committees are possible if
    - (a) 2 of the men refuse to serve together;
    - (b) 2 of the women refuse to serve together;
    - (c) 1 man and 1 woman refuse to serve together ?
  14. If 12 people are to be divided into 3 committees of respective sizes 3, 4, and 5. How many divisions are possible ?
  15. If 8 new teachers are to be divided among 4 schools, how many divisions are possible ? What if each school must receive 2 teachers ?
  16. How many subsets of size 4 of the set  $S = \{1, 2, 3, \dots, 20\}$  contain at least one of the elements 1, 2, 3, 4, 5 ?
  17. Consider  $n$ - digit numbers where each digit is one of the 10 integers 0, 1, 2,  $\dots$ , 9. How many such numbers are there for which
    - (a) no two consecutive digits are equal;
    - (b) 0 appears as a digit a total of  $i$  times,  $i = 0, 1, \dots, n$  ?
  18. A student has to sell 2 books from a collection of 6 math, 7 science, and 4 economics books. How many choices are possible if
    - (a) both books are to be on the same subject;
    - (b) the books are to be on different subjects ?
  19. How many terms are there in the multinomial expansion of  $\left(x_1 + x_2 + \dots + x_n\right)^n$ .
  20. If 8 identical blackboards are to be divided among 4 schools. How many divisions are possible ? How many, if each school must receive at least 1 blackboard ?