

## MATH ANALYSIS II

### COMBINATORICS

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 (a) under the assumption that no letter or number can be repeated in a single license plate.
2. John, Jim, Jay, and Jack have formed a band consisting of 4 instruments. If each of the boys can play all 4 instruments, how many different arrangements are possible? What if John and Jim can play all 4 instruments, but Jay and Jack can each play only piano and drums?
3. If 4 Americans, 3 French people, and 3 English 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?
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. 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 each other?
6. 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?

7. A president, treasurer, and secretary, all different, are to be chosen from a club consisting of 10 people. How many different choices of officers are possible if
- there are no restrictions;
  - A and B will not serve together;
  - C and D will serve together or not at all;
  - E must be an officer;
  - F will only serve if she is president?
8. Five separate awards are to be presented to selected students from a class of 30. How many different outcomes are possible if
- a student can receive any number of awards;
  - each student can receive at most 1 award?
9. How many 5-card poker hands are there?
10. A woman has 8 friends, of whom she will invite 5 to a party. How many choices does she have if 2 of the friends will not attend together?
11. Delegates from 10 countries, including Russia, France, England, and the United States, are to be seated in a row. How many different seating arrangements are possible if the French and English delegates are to be seated next to each other, and the Russian and U.S. delegates are not to be next to each other?

### ANSWERS

- |    |                |    |            |     |                |
|----|----------------|----|------------|-----|----------------|
| 1. | (a) 67,600,000 | 4. | (a) 720    | 7.  | (a) 720        |
|    |                |    | (b) 72     |     | (b) 672        |
|    |                |    | (c) 144    |     | (c) 384        |
|    | (b) 19,656,000 |    | (d) 72     |     | (d) 216        |
|    |                |    |            |     | (e) 576        |
|    |                | 5. | (a) 40,320 | 8.  | (a) 24,300,000 |
|    |                |    | (b) 10,080 |     | (b) 17,100,720 |
| 2. | 24; 4          |    | (c) 1152   |     |                |
|    |                |    | (d) 2880   | 9.  | 2,598,960      |
|    |                | 6. | (a) 720    | 10. | 36             |
| 3. | 5184           |    | (b) 72     |     |                |
|    |                |    | (c) 144    | 11. | 564,480        |