

**Tutorial 4 Week 5**

1.
  - (i) If  $A = \{1, 2\}$  and  $B = \{a, b, c\}$ , write down the set  $A \times B$ .
  - (ii) For  $A = \{1, 2, 3, 4\}$ , write down the subset of  $A \times A$  consisting of all those ordered pairs  $(x, y)$  such that  $x \leq y$ .
  - (iii) For  $A$  as above, let  $D$  be the subset of  $A \times A$  consisting of all ordered pairs  $(x, y)$  such that  $x = y$ . What is  $|D|$ ? Find a one-to-one correspondence between  $D$  and  $A$ .
2.
  - (i) How many strings of three upper case letters are there?
  - (ii) How many strings of three upper case letters and digits are there?
  - (iii) How many strings of three upper case letters and digits are there in which the first character is a letter?
3. Given an alphabet of 20 consonants and 6 vowels.
  - (i) In how many ways can we select a consonant and then a vowel?
  - (ii) In how many ways can we make a two-letter string consisting of one consonant and one vowel?
4. In a town of 18,000 people everyone has three initials. Must there be two people with the same initials?
5.
  - (i) How many strings of four digits are there if 0 is never used?
  - (ii) How many six digit numbers are there which do not repeat a digit and do not begin with 0?
  - (iii) How many strings of length 3 start with 2 digits and end with one of the 26 capital letters of the alphabet?
6.
  - (i) How many four digit numbers greater than 1000 can be formed using the digits 0, 1, 2, 3 and 4?
  - (ii) How many four digit numbers greater than 1000, with no repeated digit, can be formed using the digits 0, 1, 2, 3 and 4?
7. Four people are about to have a snack and there are eleven types of cake available. Each person chooses just one cake.
  - (i) How many possibilities are there?
  - (ii) How many possibilities are there if everyone has a different type of cake?

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Second Semester

Discrete Mathematics

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**Problem Set 4**

1. Suppose that there are 8 different kinds of doughnuts in a coffee shop.
  - (i) In how many ways for 5 students, to each buy 1 doughnut?
  - (ii) In how many ways for 5 students, to each buy 1 doughnut so that no two students buy the same kind?
2.
  - (i) How many 5-digit numbers, greater than 60000, can be formed from the digits 2, 3, 4, 5, 6, 7, 8, 9?
  - (ii) How many 5-digit numbers, greater than 60000, can be formed from the digits 3, 4, 5, 6, 7, 8, 9, 0?
3.
  - (i) In how many ways can we list 4 novels followed by 3 biographies if there are 8 novels and 6 biographies from which to choose?
  - (ii) How many 4-digit numbers greater than 7000 can be formed from the digits 1 to 9?
4.
  - (i) How many strings of four digits are there (with repetition) if the first digit is not 0?
  - (ii) How many strings of four digits are there without repetition if the first digit is not 0?
  - (iii) In how many ways can 8 children be seated on a bench?
  - (iv) In how many ways can 8 children be seated on a bench if three particular children must sit together?
  - (v) In how many ways can 8 children be seated on a bench if three particular children must **not** sit together?
5.
  - (i) A restaurant has five entrées, seven main courses and ten desserts. In how many ways can you select two dishes on the condition that they must not both be from the same part of the menu?
  - (ii) A dictionary consists of an alphabetical arrangement of all possible “words” of 3 or fewer letters, using the 26 letters of the alphabet. (For example, b,bz, cat, dog, xta ) The dictionary is in two volumes, A-M and N-Z. How many words are there in the A-M volume?
  - (iii) In how many ways can 8 children be seated on a bench if two particular children must sit together?
  - (iv) In how many ways can 8 children be seated on a bench if two particular children must **not** sit together?