



SCSI1013: Discrete Structure

[2019/2020 - Semester 1]

Due Date: 12 November 2019

TUTORIAL 2.1

1. Bob, John, Luke and Tim play a tennis tournament. The rules of the tournament are such that at the end of the tournament a ranking will be made and there will be no ties. How many different rankings can there be?
2. There is a basket of fruit containing an apple, a banana and an orange and there are five girls who want to eat one fruit. How many ways are there to give three of the five girls one fruit each and leave two of them without a fruit to eat?
3. How many ways are there to order the letters of the word INDESCREETNESS?
4. There are 12 hospitals in a town. How many different ways can 7 patients be sent to the hospitals so that no 2 patients may be in the same hospital.
5. A computer scientist is trying to discover the keyword for a financial account. If the keyword consists only of 10 lower case characters (e.g., 10 characters from among the set: a, b, c, ..., y, z) and no character can be repeated, how many different unique arrangements of characters exist?
6. Given 3 sets of integers. $A = \{1,3,5\}$, $B = \{4,6\}$, $C = \{0,2,7,9\}$. How many ways are there to choose one integer from set A , B , or C ?
7. A Thai restaurant offers 5 fish dishes, 3 meat dishes, 3 vegetables dishes and 2 rice dishes for dinner service.
 - a) How many different dinner meals of 5 dishes are possible if any dish can be chosen only once?
 - b) How many different dinner meals are possible if each meal can consist of 1 fish dish, 1 meat dish, 1 vegetable dish and 1 rice dish.
 - c) How many different dinner meals are possible if each meal can consist of 2 fish dishes, 2 meat dishes and 1 vegetable dish but each dish can be chosen only once?

- d) How many different dinner meals of four dishes are possible if the meal must consist only of 1 fish dish, 1 meat dish, 1 vegetable dish and 1 rice dish or the meals can consist only of 1 fish dish, 1 meat dish, and 2 different vegetable dishes?

8. A bracelet is made from 5 alphabet beads as shown in Figure 1.

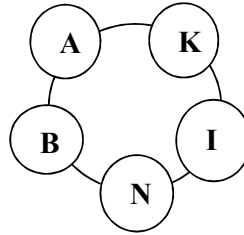


Figure 1

- a) How many designs of the bracelet can be made from the 5 beads in any possible arrangement?
- b) How many designs of the bracelet can be made if the bead with alphabet **A** and **N** should be side by side?
- c) How many designs of the bracelet can be made if the bracelet should consist of the sequence of beads **A, I, N** in any arrangement?
- d) If the 5 beads are cut loose from the bracelet and rearranged in linear sequence, how many initials of 3 alphabet beads can be made?
9. A bagel shop has 3 union bagels, 3 poppy seed bagels, 3 egg bagels, 4 salty bagels and 4 pumpernickel bagels. How many ways are there to choose
- a) a dozen bagels
- b) seven bagels of egg bagel, pumpernickel bagels and salty bagels with three egg bagels and no more than two salty bagels?
10. A linear algebra class consists of 10 mathematics majors and 12 computer science majors. A team of 12 has to be selected from this class. Find the number of ways of selecting a team if
- a) The team has 6 from each discipline
- b) The team has a majority of computer science majors

11. A bag contains exactly 5 red, 8 blue, 10 white, 12 green and 7 yellow marbles. Given that each colour represents a pigeonhole, find the least number of marbles to be chosen which will guarantee that there will be at least 4 marbles are of the same colour.
12. How many students must be in a class to guarantee that at least two students receive the same score on the final examination, is the examination is graded on a scale from 0 to 100. Explain your answer.
13. What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades – A, B, C, D and E.
14. A computer network consists of six computers. Each computer is directly connected to zero or more of the other computers. Show that there are at least two computers that are directly connected to the same number of other computers.
15. A bowl contains 10 red marble and 10 blue marbles. A girl selects marbles at random without replacement.
 - a) How many marbles must she select to be sure of getting 3 marbles of the same colour?
 - b) What is the least number of marbles must she select to be sure of getting at least 3 blue marbles?