University of Djilali Bounaama - Khemis Miliana

Faculty of Economic, Commercial, and Management Sciences
Level: First Year (Branch 2)
Subject: Statistics 2

Exercise Series No. 2: (Combinatorics)

Exercise 1: In how many ways can 5 people be seated around a circular table?

Exercise 2: How many different words (arrangements) can be formed using the letters of the following words:
* griller
* mississippi
* economie

Exercise 3: 7 people are hiking in the mountains: 3 of them are locals (mountain guides) and 4 are tourists. In how many different ways can the 7 people be arranged in a line, given that the first and the last person in the line must be locals?

Exercise 4: How many different license plates can be created using two letters followed by three digits in the following cases:
* a- Without repetition of letters or digits.
* b- Repetition of letters is allowed, but without repetition of digits.
* c- Repetition of both letters and digits is allowed.

Exercise 5: The Department of Commercial Sciences wants to form a pedagogical committee through an election process. For this purpose, 2 students from the 1st year, 3 students from the 2nd year, and 4 students from the 3rd year have applied. How many different committees can be formed from these candidates, given that the committee consists of:
* President: Must be a 3rd-year student.
* First Vice-President: Must be a 2nd-year student.
* Second Vice-President: Must be a 1st-year student.

Exercise 6: In how many ways can a committee of 5 people be formed from a group of 7 workers and 8 professors, provided that the committee must contain at least 3 workers?

Exercise 7: 4 light bulbs are drawn randomly from a box containing 10 bulbs, 6 of which are defective.
* What is the total number of possible ways to draw the bulbs?
* In how many ways can the bulbs be drawn such that exactly one bulb is non-defective (functional)?
* In how many ways can the bulbs be drawn such that at least one bulb is non-defective (functional)?

Abstract of the Third Axis : Combinatorial Analysis

There are 3 types of method in combinatorial analysis :

	without repetition	with repetition
1- Permutations	The following question is the essence of permutations : How many differnent arrangements of « n » elements are possible ? Different permutations. Generally, for « n » objects, there are : $P(n) = n! = n(n-1)(n-2)\ldots.1$ special case : **Circular Permutation** $P(n') = (n-1)!$ In this situation, there is : - No repetition - Important arrangement	The following question is the essence of permutations : How many differnent arrangements of « n » elements are possible with repetion of « r » elements ? Different permutations. Generally, for « n » objects and repetition of « r » objets , there are : $P'(n) = n! / r!$ In this situation, there is : - Repetition - Important arrangement
1- Arrangements :	The following question is the essence of Arrangements without repetition : How many diffirent ways are there to choose « r » elements out of « n » total elements without repetition ? Mathematically, one writes : $A_n^r = n! / (n-r)!$ In this situation, there is : - No repetition - Important arrangement	The following question is the essence of Arrangements without repetition : How many diffirent ways are there to choose « r » elements out of « n » total elements with repetition ? Mathematically, one writes : $AR_n^r = n^r$ In this situation, there is : - Repetition Important arrangement
2- Combinations	The following question is the essence of combinations without repetition : How many ways are there to choose « r » elements out of « n » total elements without repetition ? Mathematically, one writes : $C_n^r = n! / r! (n-r)!$ In this situation, there is : - No repetition - Unimportant arrangement	The following question is the essence of combinations with repetition : How many ways are there to choose « r » elements out of « n » total elements with repetition ? Mathematically, one writes : $C_{n+r-1}^r = (n+r-1)! / r! (n-1)!$ In this situation, there is : - Repetition Unimportant arrangement

Important in combinatorial analysis :

- $0 ! = 1$.
- $C_n^r = C_n^{n-r}$
- $C_n^n = 1$
- $C_n^0 = 1$
- $C_n^1 = n$