University of Oum El Bouaghi

Faculty of Economic Sciences, Commercial Sciences and Management Sciences

First year, common trunk

Academic year : 2023-2024

Mathematics 1 Module
First series (Combinatorial Analysis).

Exercise01: Calculate the following values

$\frac{13!}{11!}$, $\frac{600!}{598!}$, $\frac{20!}{2!\cdot 3!\cdot 5!}$, $\frac{200!}{2!\cdot 197!}$, $\frac{0!}{12!}$, $\frac{3!\cdot 15!}{12!}$

$4!\cdot 3!$, $2\cdot 3!$, $(4\cdot 3)!$, $5!+7!$, $(5+7)!$, $12!-12!$, $0!\cdot 3!$

Exercise 02: Simplify the following relationships

$$\frac{(n+1)!}{n!} , \quad \frac{(n-1)!}{(n+1)!} , \quad \frac{n!}{(n-2)!} , \quad \frac{2n!}{(2n-5)!}$$

Exercise 03: Calculate the following values

A_5^2 , A_{10}^{10} , A_{10}^{0} , $A_{50}^{1}\cdot A_{25}^{12}$

C_3^2 , C_{10}^{5} , $C_{10}^{0}+C_5^1$, $C_5^1\cdot C_5^2$

Exercise 04: **1)** Let n and k be two natural numbers. Prove that

$$C_n^k = C_{n-1}^k + C_{n-1}^{k-1}, \quad \forall 1 \le k \le n-1$$

2) Calculate C_5^2 and C_6^1 Using this relationship.

Exercise 05: Let a , b, x, y be real numbers. Publish the following sums using Newton's Binomial Theorem :

$(5+6)^5$, $(2+9)^2$, $(a+b)^2$, $(a+5)^7$, $(a+b)^6$

$$(2x-3)^5 \quad , \quad (x-y)^7 .$$

Exercise 06:

1) Using the Newton's Binomial Theorem , prove that :

$$2^n = C_n^0 + C_n^1 + C_n^2 + \cdots + C_n^n.$$

2) Using the Newton's Binomial Theorem , evaluate : 96^3.

Exercise07 : Solve the following equations :

$$\boldsymbol{a})\ 10C_n^5 = C_n^3 \quad , \quad \boldsymbol{b})\ \frac{(n+1)!}{n!} = 20 \ , \ \boldsymbol{c})\ A_n^2 = 1.$$

Exercises to solve

1) Simplify the following relationships

$$\frac{(2n+3)!}{(2n+1)!} \quad , \quad \frac{(n-1)!}{n!} - \frac{n!}{(n+1)!} \quad , \quad \frac{(n!)^2}{(n-2)!\,(n+1)!}$$

2) Solve the following equations :

$a)\quad \frac{n!}{(n-4)!} = \frac{20n!}{(n-2)!}$

$b)\quad C_{n-1}^6 + C_{n-1}^5 = C_n^{12}$

$c)\quad 3(C_n^0 + C_n^1 + C_n^2 + \cdots + C_n^n) = 2^{n-1}(C_{n-1}^1 + C_{n-1}^2).$

3) Publish the following sums using Newton's Binomial Theorem :

$$(x+2)^{n+1}, \quad (2x-1)^5, \quad \left(x + \frac{1}{x}\right)^n$$