

Exercise 1 – Simplify the following relationships:

$$\frac{13!}{11!}, \frac{3!15!}{12!}, \frac{200!}{2!198!}, \frac{5! + 7!}{6!}, \frac{14!}{13! + 12!},$$

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

Exercise 2 – Combinatorial analysis:

a. Calculate the following values: A_4^3 , A_{10}^{10} , C_3^2 , C_{10}^5

b. Let n and p be two natural numbers. Prove that:

$$C_n^p = C_{n-1}^p + C_{n-1}^{p-1}, \quad \forall 1 \leq p \leq n-1$$

Calculate C_5^2 , C_6^1 . Using this relationship.

Exercise 3 – Solve the following equations in the set of natural numbers:

· $A_n^2 - 20n = 0$

· $C_n^1 + C_n^2 = 5n$.

· $2A_n^2 + 50 = A_{2n}^2$

Exercise 4 – Publish the following sums using Newton's Binomial Theorem:

$$(x-1)^3, (x+y)^2, (3x+2)^4, \left(x + \frac{1}{x}\right)^3.$$
