Combinatorica

I.Permutari:

$P_n = n!$ $\qquad$ $0! = 1$

II.Aranjamente:

$A_n^k = \frac{n!}{(n-k)!}$ ➡ ORDONATE (conteaza ordinea)

$n \geq k$

III.Combinari:

$C_n^k = \frac{n!}{k!(n-k)!}$ ➡ NEORDONATE (nu conteaza ordinea)

$C_n^1 = n$ $\qquad$ $C_n^0 = 1$

Proprietati:

- $C_n^k = C_n^{n-k} \; - combinari\ complementare$
- $C_n^k = C_{n-1}^k + C_{n-1}^{k-1} \; - formula\ de\ recurenta$
- $C_n^0 + C_n^1 + C_n^2 + \cdots + C_n^{n-1} + C_n^n = 2^n$
- $C_n^1 + C_n^2 + \cdots + C_n^{n-1} + C_n^n = 2^n - 1$
- $C_n^0 + C_n^2 + C_n^4 + \cdots + C_n^{n-2} + C_n^n = 2^{n-1}(n - par)$
- $C_n^1 + C_n^3 + C_n^5 + \cdots + C_n^{n-3} + C_n^{n-1} = 2^{n-1}$
- $C_n^1 + 2C_n^2 + 3C_n^3 \ldots + nC_n^n = n * 2^n - 1$
- $C_n^k = \frac{n}{k} * C_{n-1}^{k-1}$

IV.Binomul lui Newton:

$$(a+b)^n = \sum_{k=0}^{n} C_n^k * a^{n-k} * b^k$$

- Termenul general:
  - $T_{k+1} = C_n^k * a^{n-k} * b^k$

!!! (Al treilea termen = T_3)

- Sa fie termen rational:
  - Faci T_{k+1}
  - Se pune conditie la radicalii de putere k

- Cel mai mare termen al dezvoltarii ($(a+b)^n$):
  - $\frac{T_{k+2}}{T_{k+1}} = \frac{n-k}{k+1} * \frac{b}{a}$
  - Scriem: $\frac{n-k}{k+1} * \frac{b}{a} > 1$
  - Gasim:

$$k \geq a+1 \rightarrow T_{k+2} < T_{k+1}$$
$$sau$$
$$k \geq a \quad\quad \rightarrow T_{k+2} > T_{k+1}$$

  - T_{a+2} = cel mai mare termen