EngineeringRise

Binomial coefficient identities and simple applications

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Sum of coefficients	sum of C(n,r) = 2^n Valid when: n is a non-negative integer	dimensionless
Alternating sum	sum of (-1)^r C(n,r) = 0 for n >= 1 Valid when: n is a positive integer (n >= 1)	dimensionless
Even-r and odd-r sums	each 2^(n-1) Valid when: n is a positive integer (n >= 1)	dimensionless
Pascal rule	C(n,r) + C(n,r-1) = C(n+1,r) Valid when: n >= 1 integers, 1 <= r <= n	dimensionless
r times C(n,r)	r C(n,r) = n C(n-1,r-1); sum = n 2^(n-1) Valid when: n is a positive integer	dimensionless
r squared	sum of r^2 C(n,r) = n(n+1) 2^(n-2) Valid when: n is a positive integer (n >= 1)	dimensionless
Product of rows	sum of C(m,r) C(n,k-r) = C(m+n,k) Valid when: m, n, k non-negative integers (Vandermonde)	dimensionless
Sum of squares	sum of C(n,r)^2 = C(2n,n) Valid when: n is a non-negative integer	dimensionless

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/binomial-theorem/binomial-coefficient-identities-and-simple-applica

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