EngineeringRise

Fundamental principle of counting and permutations

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

Result	Formula	Units or note
Multiplication principle	m ways then n ways: m x n Valid when: stages done one after another, choices independent	dimensionless
Addition principle	m ways or n ways (no overlap): m + n Valid when: alternatives that cannot happen together	dimensionless
Factorial	n! = n(n - 1)...2 x 1, with 0! = 1 Valid when: n a non-negative integer	dimensionless
Permutations	P(n, r) = n!/(n - r)! = n(n - 1)...(n - r + 1) Valid when: r different objects from n different, order matters, no repeats	dimensionless
Special cases	P(n, 0) = 1, P(n, 1) = n, P(n, n) = n! Valid when: n a non-negative integer	dimensionless
Recurrence	P(n, r) = n x P(n - 1, r - 1) Valid when: integers n >= r >= 1	dimensionless
Repetition allowed	r places, n choices each: n^r Valid when: r places each filled from n choices, repetition allowed	dimensionless
Identical objects	n!/(p! q! r!) for p, q, r identical of three kinds Valid when: p, q, r identical of three kinds, rest different, n in total	dimensionless
Digit rule	leading digit nonzero; even: units in {0, 2, 4, 6, 8}; by 5: units in {0, 5} Valid when: forming numbers with digit restrictions	dimensionless

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/permutations-and-combinations/fundamental-principle-of-counting-

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