

Permutations and Combinations

CBSE Class 11 Maths · Knowledge organiser

KEY DEFINITIONS

Fundamental principle of counting

If one thing can happen in m ways and then another in n ways, both can happen in mn ways.

Permutation

An arrangement where order matters:

$${}^nP_r = n!/(n-r)!$$

Combination

A selection where order does not matter: ${}^nC_r = n!/(r!(n-r)!)$.

KEY FORMULAS

Arrangements; selections ${}^nP_r = \frac{n!}{(n-r)!}$, ${}^nC_r = \frac{n!}{r!(n-r)!}$

Alike objects $\frac{n!}{p!q!\dots}$

Properties ${}^nC_r = {}^nC_{n-r}$, ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

WORKED EXAMPLE

How many 3-digit numbers with distinct digits can be formed from 1, 2, 3, 4, 5?

$${}^5P_3 = 5 \times 4 \times 3 = 60.$$

YOU SHOULD BE ABLE TO...

- Use the multiplication principle, simplify factorials and apply nP_r and nC_r directly.
- Solve for n in nP_r / nC_r equations, count words with restrictions and form committees.
- Combine selection and arrangement in multi-part problems about words, numbers and teams.
- Handle divisibility and digit restrictions and 'must include / must exclude' selections.

COMMON MISTAKES

- ✗ Using combinations when order matters (or the reverse).
- ✗ Letting 0 be the first digit of a number.
- ✗ Forgetting to divide by $p!$ for repeated letters, or to multiply by the arrangements inside a block.
- ✗ Adding when the principle needs multiplying ("and"), or multiplying separate cases ("or").