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Binomial Theorem, Factorial, Permutations, Combination and Probability Tricks and Formulas

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Binomial Theorem

If n is a natural number that is greater than or equal to 2, then according to the binomial theorem:

$$(x + a)^n = n_{c_0} x^n a^0 + n_{c_1} x^{n-1} a^1 + n_{c_2} x^{n-2} a^2 + n_{c_3} x^{n-3} a^3 + \dots + n_{c_n} x^0 a^n$$

Here, $n_{c_r} = \frac{n!}{(n-r)!r!}$

Factorial

$$n! = 1 \times 2 \times 3 \times \dots \times (n-1) \times n$$

$$n! = n \times (n-1)!$$

Permutations

$$n_{c_r} = \frac{n!}{(n-r)!r!}$$

Combinations

$$n_{c_r} = \frac{(n-r)!r!}{n!}$$

Important Properties

$$n_{c_r} = n_{c_{n-r}}$$

$$n_{c_0} + n_{c_1} + n_{c_2} + n_{c_3} + \dots + n_{c_n} = 2^n$$

Partition Rule

Number of ways of distributing n identical things among r persons when each person may get any number of things = $n + r - 1_{c_{r-1}}$

Probability

- Probability of an event = $\frac{\text{Number of favourable outcomes}}{\text{Number of total outcomes}}$
- odds in favour = $\frac{\text{Number of favourable outcomes}}{\text{Number of unfavourable outcomes}}$

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- odds against = $\frac{\text{Number of unfavourable outcomes}}{\text{Number of favourable outcomes}}$

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