Important Combinations Formulas PDF

Formulas
Examples
with Units

List of 22
Important Combinations Formulas

1) Maximum Value of nCr when N is Even Formula

Evaluate Formula

Formula

$$C = C\left(n, \frac{n}{2}\right)$$

Example

$$70 = C\left(8, \frac{8}{2}\right)$$

2) Maximum Value of nCr when N is Odd Formula

Evaluate Formula

Formula

$$C = C\left(n_{Odd}, \frac{n_{Odd} + 1}{2}\right)$$

Example

$$10 = C\left(5, \frac{5 + 1}{2}\right)$$

3) nCr or C(n,r) Formula

Evaluate Formula

Formula

$$C = \frac{n!}{r! \cdot (n - r)!}$$

Example

$$70 = \frac{8!}{4! \cdot (8 - 4)!}$$

4) No of Combinations of (P+Q) Things into Two Groups of P and Q Things Formula

Evaluate Formula

Formula

$$C = \frac{(p + q)!}{(p!) \cdot (q!)}$$

Example

$$1716 = \frac{(7 + 6)!}{(7!) \cdot (6!)}$$

5) No of Combinations of N Different Things taken Atleast One at once Formula

Evaluate Formula

Formula

$$C = 2^n - 1$$

Example

$$255 = 2^8 - 1$$

6) No of Combinations of N Different Things taken R at once Formula

Evaluate Formula

Formula

$$C = C(n, r)$$

Example

$$70 = C(8, 4)$$

7) No of Combinations of N Different Things taken R at once and Repetition Allowed Formula

Evaluate Formula

Formula

$$C = C((n + r - 1), r)$$

Example

$$330 = C((8 + 4 - 1), 4)$$

8) No of Combinations of N Different Things taken R at once given M Specific Things Always Occur Formula

Evaluate Formula

Formula

$$C = C\binom{n - m}{r - m}$$

Example

$$5 = C\binom{8 - 3}{4 - 3}$$

9) No of Combinations of N Different Things taken R at once given M Specific Things Never Occur Formula

Evaluate Formula

Formula

$$C = C((n - m), r)$$

Example

$$5 = C((8 - 3), 4)$$

10) No of Combinations of N Different Things, P and Q Identical Things taken Atleast One at once Formula

Evaluate Formula

Formula

$$C = (p + 1) \cdot (q + 1) \cdot (2^n) - 1$$

Example

$$14335 = (7 + 1) \cdot (6 + 1) \cdot (2^8) - 1$$

11) No of Combinations of N Identical Things into R Different Groups if Empty Groups are Allowed Formula

Evaluate Formula

Formula

$$C = C(n + r - 1, r - 1)$$

Example

$$165 = C(8 + 4 - 1, 4 - 1)$$

12) No of Combinations of N Identical Things into R Different Groups if Empty Groups are Not Allowed Formula

Evaluate Formula

Formula

$$C = C(n - 1, r - 1)$$

Example

$$35 = C(8 - 1, 4 - 1)$$

13) No of Combinations of N Identical Things taken Zero or more at once Formula

Evaluate Formula

Formula

$$C = n + 1$$

Example

$$9 = 8 + 1$$

14) Nth Catalan Number Formula

Evaluate Formula

Formula

$$C_n = \left(\frac{1}{n + 1}\right) \cdot C(2 \cdot n, n)$$

Example

$$1430 = \left(\frac{1}{8 + 1}\right) \cdot C(2 \cdot 8, 8)$$

15) Geometric Combinatorics Formulas

15.1) Number of Chords formed by joining N Points on Circle Formula

Evaluate Formula

Formula

$$N_{Chords} = C(n,2)$$

Example

$$28 = C(8,2)$$

15.2) Number of Diagonals in N-Sided Polygon Formula

Evaluate Formula

Formula

$$N_{Diagonals} = C(n,2) - n$$

Example

$$20 = C(8,2) - 8$$

15.3) Number of Rectangles formed by Number of Horizontal and Vertical Lines Formula

Evaluate Formula

Formula

$$N_{Rectangles} = C\left(N_{Horizontal\ Lines},2\right) \cdot C\left(N_{Vertical\ Lines},2\right)$$

Example

$$1620 = C(10,2) \cdot C(9,2)$$

15.4) Number of Rectangles in Grid Formula

Evaluate Formula

Formula

$$N_{Rectangles} = C\left(N_{Horizontal\ Lines}+1,2\right) \cdot C\left(N_{Vertical\ Lines}+1,2\right)$$

Example

$$2475 = C(10+1,2) \cdot C(9+1,2)$$

15.5) Number of Straight Lines formed by joining N Non-Collinear Points Formula

Evaluate Formula

Formula

$$N_{Straight\ Lines} = C(n,2)$$

Example

$$28 = C(8,2)$$

15.6) Number of Straight Lines formed by joining N Points out of which M are Collinear Formula

Evaluate Formula

Formula

$$N_{Straight\ Lines} = C(n,2) - C(m,2) + 1$$

Example

$$26 = C(8,2) - C(3,2) + 1$$

15.7) Number of Triangles formed by joining N Non-Collinear Points Formula

Evaluate Formula

Formula

$$N_{Triangles} = C(n,3)$$

Example

$$56 = C(8,3)$$

15.8) Number of Triangles formed by joining N Points out of which M are Collinear Formula

Evaluate Formula

Formula

$$N_{Triangles} = C(n,3) - C(m,3)$$

Example

$$55 = C(8,3) - C(3,3)$$

Variables used in list of Combinations Formulas above

- **C** Number of Combinations
- C_n Nth Catalan Number
- **m** Value of M
- **n** Value of N
- N_{Chords} Number of Chords
- $N_{Diagonals}$ Number of Diagonals
- $N_{Horizontal\ Lines}$ Number of Horizontal Lines
- n_{Odd} Value of N (Odd)
- $N_{Rectangles}$ Number of Rectangles
- $N_{Straight\ Lines}$ Number of Straight Lines
- $N_{Triangles}$ Number of Triangles
- $N_{Vertical\ Lines}$ Number of Vertical Lines
- **p** Value of P
- **q** Value of Q
- **r** Value of R

Constants, Functions, Measurements used in list of Combinations Formulas above

- Functions: **C**, C(n,k)
  In combinatorics, the binomial coefficient is a way to represent the number of ways to choose a subset of objects from a larger set. It is also known as the "n choose k" tool.

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