

Permutation of n objects, selected r at a time (no repetition): $n!/(n - r)!$

Permutation of n objects, selected r at a time (w repetition): n^r

Permutation of n objects, n at a time,
 c_1 indistinguishable objects of type 1,
 c_2 ... of type 2

...

c_n : $n!/(c_1! * c_2! * ... * c_n!)$

Combination of n objects, selected r at a time (no repetition): $C(n, r) = n!/((n - r)! r!)$

Combination of n objects, selected r at a time (w repetition): $C(n + r - 1, r)$

Combination of n objects, selected r at a time (w repetition, all of the objects must be selected): $C(n + r - 1, r - 1)$

Ex: $x + y + z = 100$, $x, y, z \geq 0$,

1. $(8! / (3! * 2!))$ Permutation, w indistinguishable objects
2. $n = 40, r = 12, C(40 + 12 - 1, 12 - 1)$
3. 4^{100} Permutation with repetition
4. $C(100 + 4 - 1, 4 - 1)$ Combination w repetition, all must be selected
5. $C(20, 5) * C(20, 5)$ Variation on a standard combination
6.
 - a. $10! / (4! * 3! * 3!)$
 - b. Number of strings with 8 1s $C(10, 8)$ there are 2^2 remaining strings
 $C(10, 8) * 2^2$
 Number of strings with 9 1s $C(10, 9) * 2^1$
 Number of strings with 10 1s $C(10, 10) * 2^0 = 1$
 - c. 4 1s. $C(10, 4)$
 2 2s. $C(10, 2)$
 2 1s and 1 2. $C(10, 2) * C(8, 1)$

