

Combinatorial functions	
Function signature	Description
a2b(a,b) a2b(a,b,d)	Examples: a2b(20,29) $\Rightarrow$ [20, 21, 22, 23, 24, 25, 26, 27, 28, 29] a2b(29,20) $\Rightarrow$ [] len(a2b(100,500,5)) $\Rightarrow$ 81 a2b(29,20,-1) $\Rightarrow$ [29, 28, 27, 26, 25, 24, 23, 22, 21, 20]
rd_selection(X,k=1) combination(n,k=1) permutation(n) Note: rd_selection = rd_choice = rd_sample	Examples: rd_selection("abcdefghijklmnopqrstuvwxyz", 6) $\Rightarrow$ ['j', 'r', 'f', 'm', 'e', 'c'] combination(10,5) $\Rightarrow$ [2, 3, 4, 7, 8] permutation(10) $\Rightarrow$ [5, 3, 7, 2, 8, 0, 1, 6, 9, 4]
binom(n,k) binomial = binom	Example: [binom(10,k) for k in a2b(0,10)] $\Rightarrow$ [1, 10, 45, 120, 210, 252, 210, 120, 45, 10, 1]
volume (n, r, q) volume (n, r) = volume (n, r, 2)	The cardinal of the Hamming ball of radius r in the q-ary Hamming space of length n (F^n , with $ F = q$).
ub_singleton (n, d, q) ub_singleton (n, d)	The Singleton upper bound on M for codes (n,M,d)_q.
ub_sphere (n, d, q) ub_sphere (n, d) = ub_sphere (n, d, 2)	The sphere (or Hamming) upper bound on M for codes (n,M,d)_q.
lb_gilbert (n, d, q) lb_gilbert (n, d) = lb_gilbert (n, d, 2)	The Gilbert lower bound on M for codes (n,M,d)_q.
lb_gilbert_varshamov (n, d, q) lb_gilbert_varshamov (n, d) = lb_gilbert_varshamov (n, d, 2)	The Gilbert-Varshamov lower bound on M for codes (n,M,d)_q.