

N = number of items in the vector/hash table  
 S = size of the vector  
 new = number of times “new” operator is used  
 copy = number of items that have to be copied.

1. Resizing scheme = increment size by 1.

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14
S	1	2	3	4	5	6	7	8	9	10	11	12	13	14
new	1	1	1	1	1	1	1	1	1	1	1	1	1	1
copy	1	2	3	4	5	6	7	8	9	10	11	12	13	14
total copies	1	3	6	10	15	21	28	36	45	55	66	78	91	105

total copies =  $\frac{1}{2}N^2 + \frac{1}{2}N = O(N^2)$  = quadratic

total number of times new is used = N

2. Resizing scheme = double size

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	..	31	32	33	..	64	65
S	1	2	4	4	8	8	8	8	16	16	16	16	16	16	16	16	32	32	32		32	32	64		64	128
new	1	1	1		1				1							1							1			1
copy	1	2	3	1	5	1	1	1	9	1	1	1	1	1	1	17	1	1			1	1	33		1	65
total copies	1	3	6	7	12	13	14	15	24	25	26	27	28	29	30	31	48	49	50		62	63	96		127	192
tot-N	0	1	3	3	7	7	7	7	15	15	15	15	15	15	15	15	31	31	31		31	31	63		63	127

total - N is always less than 2N  
 therefore total is always less than 3N

total number of operations = total time = O(N) = linear.

total number of times new is used = O(logN)