

Linear Probing, hash function: $h(k,i) = ((5k + 3) \bmod 8 + i) \bmod 8$

Insert 41: $h(41,0) = 0 \rightarrow$ insert to index 0

Insert 30: $h(30,0) = 1 \rightarrow$ insert to index 1

Insert 74: $h(74,0) = 5 \rightarrow$ insert to index 5

Insert 55: $h(55,0) = 6 \rightarrow$ insert to index 6

Insert 68: $h(68,0) = 7 \rightarrow$ insert to index 7

Insert 39: $h(39,0) = 6$ (occupied), $h(39,1)$ (collision) = 7 (occupied), $h(39,2)$ (collision)=0 (occupied), $h(39,3)$ (collision) = 1 (occupied), $h(39,4)$ (collision) = 2 \rightarrow insert to index 2

Insert 64: $h(64,0) = 3 \rightarrow$ insert to index 3

Insert 72: $h(72,0) = 3$ (occupied), $h(72,1)$ (collision) = 4 \rightarrow insert to index 4

Index	Element
0	41
1	30
2	39
3	64
4	72
5	74
6	55
7	68

Quadratic Probing, hash function: $h(k,i) = (((3k + 1) \bmod 8) + i^2) \bmod 8$

Insert 19: $h(19,0) = 0 \rightarrow$ insert to index 0

Insert 29: $h(29,0) = 2 \rightarrow$ insert to index 2

Insert 16: $h(16,0) = 3 \rightarrow$ insert to index 3

Insert 26: $h(26,0) = 5 \rightarrow$ insert to index 5

Insert 14: $h(14,0) = 1 \rightarrow$ insert to index 1

Insert 24: $h(24,0) = 3$ (occupied), $h(24,1) = 0$ (occupied), $h(24,2) = 1$ (occupied), $h(24,3) = 6 \rightarrow$ insert 24 to index 6

Insert 13: $h(13,0) = 2$ (occupied), $h(13,1) = 3$ (occupied), $h(13,2) = 0$ (occupied), $h(13,3) = 1$ (occupied), $h(13,4) = 6$ (occupied), $h(13,5) = 7 \rightarrow$ insert to index 7

Insert 27: $h(27,0) = 0$ (occupied), $h(27,1) = 1$ (occupied), $h(27,2) = 6$ (occupied), $h(27,3) = 7$ (occupied), $h(27,4) = 4 \rightarrow$ insert to index 4

Index	Element
0	19
1	14
2	29
3	16
4	27
5	26
6	24
7	13

Double Hashing, hash function: $h(k,i) = (((3*k) \bmod 8) + i * (((5*k + 3) \bmod 7) + 1)) \bmod 8$

Insert 30: $h(30,0) = 2 \rightarrow$ insert to index 2

Insert 14: $h(14,0) = 2$ (occupied), $h(14,1) = 6 \rightarrow$ insert to index 6

Insert 40: $h(40,0) = 0 \rightarrow$ insert to index 0

Insert 36: $h(36,0) = 4 \rightarrow$ insert to index 4

Insert 56: $h(56,0) = 0$ (occupied), $h(56,1) = 4$ (occupied), $h(56,2) = 0$ (occupied), $h(56,3) = 4$ (infinite loop), resize the table.

New hash function: $h(k,i) = (((3*k) \bmod 8) + i * (((5*k + 3) \bmod 7) + 1)) \bmod 16$

Insert 30: $h(30,0) = 2 \rightarrow$ insert to index 2

Insert 14: $h(14,0) = 2$ (occupied), $h(14,1) = 6 \rightarrow$ insert to index 6

Insert 40: $h(40,0) = 0 \rightarrow$ insert to index 0

Insert 36: $h(36,0) = 4 \rightarrow$ insert to index 4

Insert 56: $h(56,0) = 0$ (occupied), $h(56,1) = 4$ (occupied), $h(56,2) = 8 \rightarrow$ insert to index 8

Insert 75: $h(75,0) = 1 \rightarrow$ insert to index 1

Insert 49: $h(49,0) = 3 \rightarrow$ insert to index 3

Insert 50: $h(50,0) = 6$ (occupied), $h(50,1) = 8$ (occupied), $h(50,2) = 10 \rightarrow$ insert to index 10

Index	Element
0	40
1	75
2	30
3	49
4	36
5	-
6	14
7	-
8	56
9	-
10	50
11	-
12	-
13	-
14	-
15	-

Cuckoo Hashing, hash function: $(3*k + 1) \bmod 7$ for table 1, $(\text{floor}(5*k / 2) + 3) \bmod 7$ for table 2

Insert 10: $h_1(10) = 3$, insert to index 3 in table 1

Insert 22: $h_1(22) = 4$, insert to index 4 in table 1

Insert 24: $h_1(24) = 3$, 10 is already at 3, replace 10 with 24, $h_2(10) = 0$, insert 10 to index 0 in table 2

Insert 17: $h_1(17) = 3$, 24 is already at 3, replace 24 with 17, $h_2(24) = 0$, replace 10 with 24, $h_1(10) = 3$, replace 17 with 10, $h_2(17) = 3$, insert 17 to index 3 in table 2

Insert 85: $h_1(85) = 4$, 22 is already at 4, replace 22 with 85, $h_2(22) = 2$, insert 22 to index 2 in table 2

Insert 23: $h_1(23) = 0$, insert to 0 in table 1

Insert 12: $h_1(12) = 2$, insert to 2 in table 1

Insert 46: $h_1(46) = 6$, insert to 6 in table 1

Index	0	1	2	3	4	5	6
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Table 1	23	-	12	10	85	-	46
Table 2	24	-	22	17	-	-	-