Linear Probing $h(k) = (5k+3) \bmod 8$, cap = 8

Insert 41: $h(41) = 0 \to$ insert to index 0 (size = 1)

Insert 30: $h(30) = 1 \to$ insert to index 1 (size = 2)

Insert 74: $h(74) = 5 \to$ insert to index 5 (size = 3)

Insert 55: $h(55) = 6 \to$ insert to index 6 (size = 4)

Insert 68: $h(68) = 7 \to$ insert to index 7 (size = 5)

Insert 39: $h(39) = 6$ (occupied), $+1+1+1+1$ (collision) = 2
  insert to index 2 (size = 6)

Insert 64: $h(64) = 3 \to$ insert to index 3 (size = 7)

Insert 72: $h(72) = 3$ (occupied), $+1 = 4$
  insert to index 4 (size = cap = 8)

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

Quadratic Probing $h(k) = (3k+1) \mod 8$

Insert 19: $h(19) = 2 \rightarrow$ insert to index 2

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

Insert 16: $h(16) = 1 \rightarrow$ insert to index 1

Insert 26: $h(26) = 7 \rightarrow$ insert to index 7

Insert 14: $h(14) = 3 \rightarrow$ insert to index 3

Insert 24: $h(24) = 1$ (occupied), $+1^2 = 4 \rightarrow$ insert to index 4

Insert 13: $h(13) = 0$ (occupied), $+1^2 = 1$ (occupied), $+2^2 = 5$
insert to index 5

Insert 27: $h(27) = 2$ (occupied), $+1^2 = 3$ (occupied), $+2^2 = 7$ (occured)
$+3^2 = 0$ (occupied), $+4^2 = 0$ (occupied), $+5^2 = 1$ (0),
$+6^2 = 5$ (0), $+7^2 = 6 \rightarrow$ insert to index 6

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

Double Hashing $h1(k) = (3k) \mod 8$

$$h_2(k) = ((5k+3) \mod 7) + 1$$

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

Insert 14: $h(14) = 2$ (occupied), $(2+4)\%8 = 6 \rightarrow$ insert to index 6

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

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

Insert 56: $h(56) = 0$ (occupied), $(0+4)\%8 = 4$ (occupied),

$\qquad (0+2*4)\%8 = 0$ (occupied), $(0+3*4)\%8 = 4$ (occupied)

$\qquad \qquad \cdots$

$\qquad$ infinite loop, resize capacity to 16

Rehashing:

insert 30: $h(30) = 2 \rightarrow$ index 2

insert 14: $h(14) = 2$ (occupied), $(2+4)\%16 = 6 \rightarrow$ index 6

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

insert 36: $h(36) = 4 \rightarrow$ index 4

insert 56: $h(56) = 0$ (occupied), $(0+4)\%16 = 4$ (occupied),

$\qquad (0+2*4)\%16 = 8 \rightarrow$ index 8

insert 75: $h(75) = 1 \rightarrow$ index 1

insert 49: $h(49) = 3 \rightarrow$ index 3

insert 50: $h(50) = 6$ (occupied), $(6+2)\%16 = 8$ (occupied),

$\qquad (6+2*2)\%16 = 10 \rightarrow$ index 10

Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Element	40	75	30	49	36	-	14	-	56	-	50	-	-	-	-	-	-

Cuckoo Hashing

$h_1(k) = (3k+1)$
$h_2(k) = (floor(5k/2)+3)$

insert 10: $h_1(10) = 3 \rightarrow$ index 3 in table 1

insert 22: $h_1(22) = 4 \rightarrow$ index 4 in table 1

insert 24: $h_1(24) = 3$ (collision) $\rightarrow$ index 3 in table 1
       insert 10: $h_2(10) = 0 \rightarrow$ index 0 in table 2

insert 17: $h_1(17) = 3$ (collision) $\rightarrow$ index 3 in table 1
       insert 24: $h_2(24) = 0$ (collision)

Re-hashing   resize capacity to 28 (14 for each)

insert 10: $h_1(10) = 3 \rightarrow$ table 1 index 3

insert 22: $h_1(22) = 11 \rightarrow$ table 1 index 11

insert 24: $h_1(24) = 3$ (collision) $\rightarrow$ index 3 in table 1
       insert 10: $h_2(10) = 0 \rightarrow$ index 0 in table 2

insert 17: $h_1(17) = 10 \rightarrow$ index 10 in table 1

insert 85: $h_1(85) = 4 \rightarrow$ index 4 in table 1

insert 23: $h_1(23) = 0 \rightarrow$ index 0 in table 1

insert 12: $h_1(12) = 9 \rightarrow$ index 9 in table 1

insert 46: $h_1(46) = 13 \rightarrow$ index 13 in table 1

Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Table 1	23			24	85					12	17	22		46
Table 2	10													