11.12

Division method $h(k) = k \bmod m$

1) Let $m = 11$

$h(1892) = 1892 \% 11 = 0$

$h(1921) = 1921 \% 11 = 7$

$h(2007) = 2007 \% 11 = 5$

$h(3456) = 3456 \% 11 = 2$

Multiplication method

$m = 11, A = 0.618$ $\quad h(k) = \lfloor m \{kA \bmod 1\} \rfloor$

$h(1892) = \lfloor 11 (1892 \times 0.618 \bmod 1) \rfloor$

$= \lfloor 11 (0.2560) \rfloor$

$= 2.816 = 2$

$h(1921) = \lfloor 11 (1921 \times 0.618 \bmod 1) \rfloor = \lfloor 11 (0.6520) \rfloor$

$= 7.172 = 7$

$h(2001) = \lfloor 11 (2001 \times 0.618 \bmod 1) \rfloor = \lfloor 11 (0.6500) \rfloor$

$h(3456) = \lfloor 11 (3456 \times 0.618 \bmod 1) \rfloor = \lfloor 11 (0.8020) \rfloor$

mid. Square method

$k = 1892, \quad k^2 = 3,5,79,664, \quad h(1892) = 96$

$k = 2007, \quad k^2 = 4.0.28.0401, \quad h(2007) = 80$

$k = 3456, \quad k^2 = 11.943,936, \quad h(3456) = 43$

Folding method

key	1892	1821	2007	34 56
parts	18 and 92	18 and 21	20 and 07	34 and 56
sum	110	40	27	90
Hash value	10	40	27	90

2) Linear probing

$h(k,i) = [h'(k) + i] \bmod m$

87, 72, 63, 42, 36, 18, 29, 101 : m = 11

step 1

$h(27,0) = (27 \bmod 11 + 0) \bmod 11$

$= 5 \bmod 11 = 5$

0	1	2	3	4	5	6	7	8	9	10
					27					

step 2

$h(72,0) = (72 \bmod 11 + 0) \bmod 11 = 6 \bmod$

0	1	2	3	4	5	6	7	8	9	10
					27	72				

0	1	2	3	4	5	6	7	8	9	10
101	29	36		27	72	18	63	42		

Double Hashing

$h[k,i] = [h_1(k) + i h_2(k)] \bmod m$; $h_1 = k \bmod 11$, $h_2 = k \bmod 7$

$h(72,0) = (72 \bmod 11 + 0 \times 72 \bmod 7) \bmod 11 = 6 \bmod 11 = 5$

$h(63,0) = (63 \bmod 11 + 0 \times 63 \bmod 7) \bmod 11 = 8 \bmod 11 = 8$

$h(42,0) = (42 \bmod 11 + 0 \times 42 \bmod 7) \bmod 11 = 9 \bmod 11 = 9$

$h(29,3) = (29 \bmod 11 + 3 \times 29 \bmod 7) \bmod 11 = (7+7) \bmod 11 = 10$

$h(101,0) = (101 \bmod 11 + 0 \times 101 \bmod 1) \bmod 11 = 2 \bmod 11 = 2$

0	1	2	3	4	5	6	7	8	9	10
		101	36	27	72	18	63	42	29	

Chaining

$h(k) = k \bmod m$, $m = 11$

$h(27) = 27 \bmod 11 = 5$

$h(72) = 72 \bmod 11 = 6$

$h(63) = 63 \bmod 11 = 8$

$h(42) = 42 \bmod 11 = 9$

$h(36) = 36 \bmod 11 = 3$

$h(18) = 18 \bmod 11 = 7$

$h(29) = 29 \bmod 11 = 2$

$h(101) = 101 \bmod = 2$