(a) linear probing

liner probing使用的hash function为
$h(key) = (h'(key) + i) mod m$

其中$i = 0, 1, \ldots m-1, m = 11, h'(key) = key$

即$h(key) = (key + i) mod 11$

hash code	0	1	2	3	4	5	6	7	8	9	10
key			68				72	28	96	63	43
$h(key)$			2				6	7	8	9	10
comparison times			1				1	2	1	2	1

the average number of key comparisons done in successful cases under the assumption of equal likelihood:$\frac{6}{11}$

(b) quadratic probing

quadratic probing使用的hash function为

$h(key) = (h'(key) + c_1 i + c_2 i^2) mod m$

其中c_1，c_2为正的辅助常数, $i = 0, 1, \ldots, m-1$,

令$c_1 = 0$，$c_2 = 1, m = 11, h'(key) = key$

即$h(key) = (key + i^2) mod 11$

hash code	0	1	2	3	4	5	6	7	8	9	10
key			68		28		72		96	64	43
$h(key)$			2		4		6		8	9	10
comparison times			1		3		1		1	2	1

(c) resolved by incrementing the table index by key / 11 as many times as required.

key	key/11
96	8
43	3
72	6

key	key/11
68	6
63	5
28	2

$h(key) = (\frac{key}{11} + i) mod 8$

hash code	0	1	2	3	4	5	6	7
key	96	68	28	43		63		72

(d) chaining

$h(key) = key \ mod \ 11$

hash code	value
0	None
1	None
2	68→63
3	None
4	None
5	None
6	72→28
7	None
8	96
9	None
10	43