Quadratic Probing

$$m = 10 \qquad\qquad LP(v,i) = (hf(v) + i) \% m$$

$$hf(v) = v \% m$$

values = 50, 75, 99, 20, 35, 88, 45, 23, 55, 67

$$QP(v,i) = (hf(v) + c_1 i + c_2 i^2) \% m$$

$\hookrightarrow$ H collisions

$\underline{c_1 = c_2 = 1}$ Best case → O(1)

Hash Table

key	value
0	50
1	45
2	20
3	23
4	
5	75
6	
7	35
8	88
9	99

$QP(50,0) = hf(50) = 50 \% 10 = 0$

$\hookrightarrow (0+0+0) \% 10 = 0$

$QP(75,0) = hf(75) = 75 \% 10 = 5$

$(5+0+0) \% 10 = 5$

$QP(99,0) = hf(99) = 99 \% 10 = 9$

$(9+0+0) \% 10 = 9$

$QP(20,0) = hf(20) = 20 \% 10 = 0$

$(0+0+0) \% 10 = 0$

$QP(20,1) = (0+1+1) \% 10 = 2$

$QP(35,0) = hf(35) = 35 \% 10 = 5 \longrightarrow (5+0+0) \% 10 = 5$

$QP(35,1) = (5+1+1) \% 10 = 7$

$QP(88,0) = hf(88) = 88 \% 10 = 8$

$\hookrightarrow (8+0+0) \% 10 = 8$

$QP(45, 0) = hf(45) = 45 \% 10 = 5$

$\quad\quad \hookrightarrow (5+0+0) \% 10 = 5$

$QP(45, 1) = (5+1+1) \% 10 = 7$

$QP(45, 2) = (5+2+4) \% 10 = 1$

$\underline{\left(hf(v) + c_1 i + c_2 i^2 \right) \% m}$

$QP(23, 0) = hf(23) = 23 \% 10 = 3$

$\quad\quad \hookrightarrow \underline{\left(3+0+0 \right) \% 10 = 3}$

$QP(55, 0) = hf(55) = 55 \% 10 = 5$

$\quad\quad \hookrightarrow \underline{(5+0+0) \% 10 = 5} \checkmark$

$\underline{(5, 7, 1)}$
$\hookrightarrow$ **already**
filled

$QP(55, 1) = (5+1+1) \% 10$

$\quad\quad \underline{= 7} \checkmark$

cycle $\Bigg\{$ $QP(55, 2) = (5+2+4) \% 10$

$\quad\quad \underline{= 1} \checkmark$

$QP(55, 3) = (5+3+9) \% 10$

$\quad\quad = \underline{17 \% 10 = 7} \checkmark$

$QP(55, 4) = (5+4+16) \% 10$

$\quad\quad = \underline{5} \checkmark$

$$QP(67,0) = hf(67) = 7$$
$$\llcorner (7+0+0)\%10 = 7$$

$\underline{(7,9,3)}$

cycle

$$QP(67,1) = (7+1+1)\%10$$
$$= 9$$

Worst case
Search time
$\llcorner O(n)$

$$QP(67,2) = (7+2+4)\%10$$
$$= 3$$

$$QP(67,3) = (7+3+9)\%10$$
$$= 9$$

$$QP(67,4) = (7+4+16)\%10$$
$$= 7$$

$hf(77) = 7$

↑ wa~~s~~tage of time

value = $\boxed{77}$ → Same path followed

$(value = 67)$

$\llcorner hf(67) = 7$

Drawback → $\begin{cases} \text{secondary} \\ \text{clustering} \end{cases}$

Delete
↳ replace → $ symbol

Rehashing → get rid of all
$ Symbols