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6)

$m = 7$, open addressing, elems: $18, 30, 44, 12, 9$

a) linear probing

$$h(k, i) = (k \% m + i) \% m$$
$$= (k \% 7 + i) \% 7$$

$i = \overline{0, 6}$

0	1	2	3	4	5	6
		30	44	18	12	9

$$h(18, 0) = (4 + 0) \% 7 = 4$$
$$h(30, 0) = (2 + 0) \% 7 = 2$$
$$h(44, 0) = (2 + 0) \% 7 = 2$$
$$h(44, 1) = (2 + 1) \% 7 = 3$$
$$h(12, 0) = (5 + 0) \% 7 = 5$$
$$h(9, 0) = (9 + 0) \% 7 = 2$$
$$h(9, 1) = 3$$
$$h(9, 2) = 4$$
$$h(9, 3) = 5$$
$$h(9, 4) = 6$$

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b) quadratic probing

$$h(k,i) = (k \% m + i + i^2) \% m$$

$$= (k \% 7 + i + i^2) \% 7 \qquad i = \overline{0,6}$$

0	1	2	3	4	5	6
9	44	30		18	12	

$$h(18,0) = (18 \% 7 + 0 + 0) \% 7 = 4$$

$$h(30,0) = (30 \% 7 + 0 + 0) \% 7 = 2$$

$$h(44,0) = (44 \% 7 + 0 + 0) \% 7 = 2$$

$$h(44,1) = (2 + 1 + 1) \% 7 = 4$$

$$h(44,2) = (2 + 2 + 4) \% 7 = 1$$

$$h(12,0) = (12 \% 7 + 0 + 0) \% 7 = 5$$

$$h(9,0) = (9 \% 7 + 0 + 0) \% 7 = 2$$

$$h(9,1) = (2 + 1 + 1) \% 7 = 4$$

$$h(9,2) = (2 + 2 + 4) \% 7 = 1$$

$$h(9,3) = (2 + 3 + 9) \% 7 = 14 \% 7 = 0$$

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c) double hashing

$$h(k,i) = \left(k \% m + i \cdot \left(\lfloor k/7 \rfloor + 1\right)\right) \% m, \quad i = \overline{0,6}$$

$$h(k,i) = \left(k \% 7 + i \cdot \left(\lfloor k/7 \rfloor + 1\right)\right) \% 7$$

0	1	2	3	4	5	6
		30		18	12	9

$$h(18,0) = (4 + 0) \% 7 = 4$$

$$h(30,0) = (2+0) \% 7 = 2$$

$$h(44,0) = (2+0) \% 7 = 2$$

$$h(44,1) = \left(2 + 1 \cdot \underbrace{\left(\lfloor 44/7 \rfloor + 1\right)}_{6}\right) \% 7 = (2+7) \% 7 = 2$$

$$h(44,2) = (2 + 2 \cdot 7) \% 7 = 16 \% 7 = 2$$

$$h(44,3) = (2 + 3 \cdot 7) \% 7 = 2$$

.... $\underline{44}$ cannot be added! $h(44,i)$ always
returns 2, which is already occupied. Skipping it!

$$h(12,0) = (5 + 0) \% 7 = 5$$

$$h(9,0) = (2 + 0) \% 7 = 2$$

$$h(9,1) = (2 + 1 \cdot (1+1)) \% 7 = (2+2) \% 7 = 4$$

$$h(9,2) = (2 + 2 \cdot 2) \% 7 = (2 + 4) \% 7 = 6$$