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Map ADT and Hash Tables

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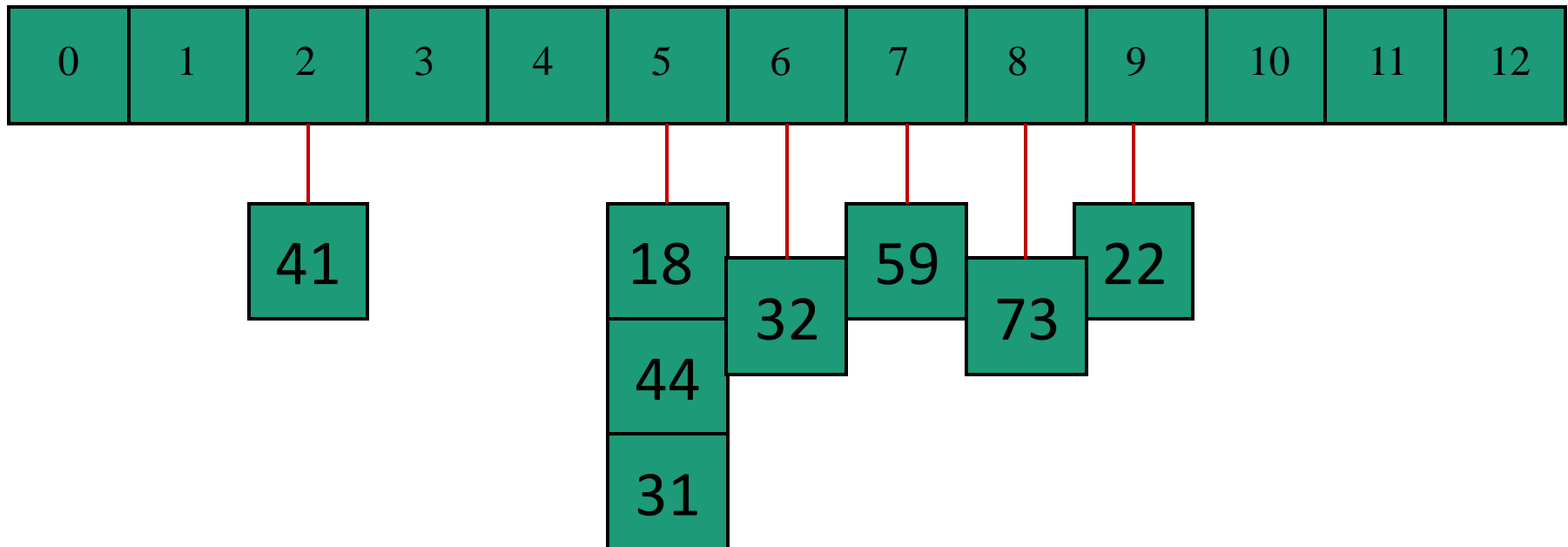
Exercise 1: separate chaining

- Insert keys 18, 41, 22, 44, 59, 32, 31, 73 in this order, for map with separate chaining, given $h(x) = x \bmod 13$

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x	18	41	22	44	59	32	31	73
h(x)	5	2	9	5	7	6	5	8



Exercise 2: linear probing

- Insert keys 18, 41, 22, 44, 59, 32, 31, 73 in this order, for map with linear probing, given $h(x) = x \bmod 17$.

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- Insert keys 18, 41, 22, 44, 59, 32, 31, 73 in this order, for map with linear probe, given $h(x) = x \bmod 17$.

x	18	41	22	44	59	32	31	73
h(x)	1	7	5	10	8	15	14	5

	18				22	73	41	59		44				31	32	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Exercise 3: double hashing

- Insert keys 18, 41, 22, 44, 59, 32, 31, 73 in this order, for map with double hashing,
 - $N = 17$
 - $h(x) = (3x+5) \bmod 17.$
 - $d(x) = 11 - (x \bmod 11)$

Exercise 3: double hashing

- $N = 17$, $h(x) = (3x+5) \bmod 17$, $d(x) = 11 - (x \bmod 11)$

x	h(x)	d(x)	Probe
18	8	4	8
41	9	3	9
22	3	11	3
44	1	11	1
59	12	7	12
32	16	1	16
31	13	2	13
73	3	4	3

- 第1次探测: $(3 + 1 \times 4) \bmod 17 = 7$ (
- 第2次探测: $(3 + 2 \times 4) \bmod 17 = 11$

	44		22				73	18	41			59	31			32
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Exercise 4

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5) \bmod 11$, to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, assuming collisions are handled by chaining.

Exercise 4: Solution

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5) \bmod 11$, to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, assuming collisions are handled by chaining.

0	1	2	3	4	5	6	7	8	9	10
13	94				44			12	16	20
	39				88			23	5	
					11					

Exercise 5

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5) \bmod 11$, to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, assuming collisions are handled by linear probing.

Exercise 5: Solution

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5) \bmod 11$, to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, assuming collisions are handled by linear probing.

0	1	2	3	4	5	6	7	8	9	10
13	94	39	16	5	44	88	11	12	23	20

Exercise 6

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5) \bmod 11$, to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, when collisions are handled by double hashing using the secondary hash function $h'(k) = 7 - (k \bmod 7)$.

Exercise 6: Solution

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5) \bmod 11$, to hash the keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, and 5, when collisions are handled by double hashing using the secondary hash function $h'(k) = 7 - (k \bmod 7)$.

0	1	2	3	4	5	6	7	8	9	10
13	94	23	88	39	44	11	5	12	16	20