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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 mod 13

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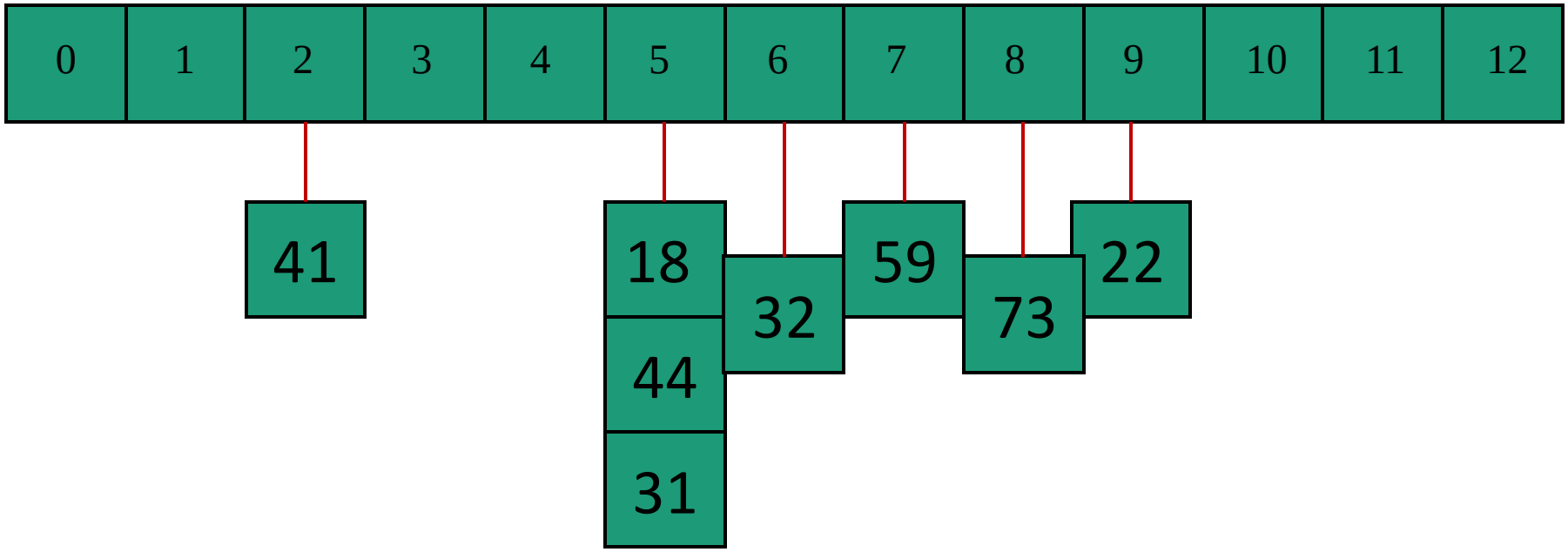
x	18	41	22	44	59	32	31	73
h(x)	5	2	9	5	7	6	5	8



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 mod 17.

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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) mod 17.
  - d(x) = 11 - (x mod 11)

Exercise 3: double hashing

- N = 17, h(x) = (3x+5) mod 17, d(x) = 11 - (x mod 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	7

	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, $h(i) = (3i + 5)\ mod\ 11$, 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, $h(i) = (3i + 5)\ mod\ 11$, 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 39				44 88 11			12 23	16 5	20

Exercise 5

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5)\ mod\ 11$, 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, $h(i) = (3i + 5)\ mod\ 11$, 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, $h(i) = (3i + 5)\ mod\ 11$, 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 $h'(k) = 7 - (k\ mod\ 7)$.

Exercise 6: Solution

Draw the 11-entry hash table that results from using the hash function, $h(i) = (3i + 5)\ mod\ 11$, 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 $h'(k) = 7 - (k\ mod\ 7)$.

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