

Assignment 03Deadline: **Wed. 06.12.2023, 23:59****2. Double Hashing****10 points**Apply the **double hashing** algorithm presented in the exercise using **pen & paper**.

In contrast to example 1, this algorithm doesn't need additional memory for the insertion of colliding elements. In case of collisions no overflow list is used, instead the elements are stored at other vacant positions in the hash table using a 2nd hash function. The two hash functions $h1$ and $h2$ are defined as

$$h1(k) = k \bmod N$$

$$h2(k) = 1 + k \bmod (N-1)$$

where k is the key and N is the length of the hash table.

Calculate hash and offset as

$$hash = h1(k)$$

$$offset = h2(k)$$

Resolve any collisions by (repeatedly) applying the following probing sequence:

$$hash = (hash + offset) \% N$$

a) Prefilling of table

Fill the following table using the provided insert statements:

For each digit also provide the probing sequence (indices separated by commas).

insert(32)

0	1	2	3	4	5	6	7	8	9	10	11	12
						32						

Probing sequence:

6, 3, 0, 9, 7, 4, 1, 10, 8, 5, 2, 11, 12

insert(18)

0	1	2	3	4	5	6	7	8	9	10	11	12
					18	32						

Probing sequence:

					18	32						
--	--	--	--	--	----	----	--	--	--	--	--	--

Probing sequence:

5, 12, 6, 1, 8, 3, 10, 4, 11, 2, 9, 0, 7

Assignment 03

Deadline: **Wed. 06.12.2023, 23:59**

insert(24)

0	1	2	3	4	5	6	7	8	9	10	11	12
					18	32					24	

Probing sequence:

11, 0, 1

insert(39)

0	1	2	3	4	5	6	7	8	9	10	11	12
39					18	32					24	

Probing sequence:

0, 4, 8, 12, 2, 6, 10, 1, 5, 9, 3, 7, 11

insert(27)

insert(27)

0	1	2	3	4	5	6	7	8	9	10	11	12
39	27				18	32					24	

Probing sequence:

1, 5, 9, 2, 6, 10, 3, 7, 11, 4, 8, 0, 12

Assignment 03

Deadline: **Wed. 06.12.2023, 23:59**

b) Insert of student ID

Fill the table, that is now prefilled with keys from part a), with the three rightmost digits of your student id. Again, note the probing sequence.

Please make a note in case one of the digits of your student id cannot be entered due to being a duplicate. Still write down the probing sequence that leads to the duplicate detection.

e.g.: student id = k12345**678** -> insert(8), insert(7), insert(6)

Student id: k X X X X X ^{1 2 2 1 1 2} _{d6 d7 d8} ^{2 9}
duplicate!

insert(d8)

0	1	2	3	4	5	6	7	8	9	10	11	12
39	27				18	32			9		24	

Probing sequence:

9, 10, 0, 11, 1, 12, 2, 3, 4, 5, 6, 7, 8

insert(d7)

0	1	2	3	4	5	6	7	8	9	10	11	12

0	1	2	3	4	5	6	7	8	9	10	11	12
39	27	2			18	32			9		24	

Probing sequence:

insert(d6)

0	1	2	3	4	5	6	7	8	9	10	11	12
39	27	2			18	32			9		24	

Probing sequence:

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 0, 1, 12