CSC 212 Tutorial #12 Solution

Hash

Problem 1

Linear Rehashing

	Hash	Probs
0	28	1
1	71	1
2	43	2
3	56	4
4	11	1
5	17	3
6	63	7

(No space for 6 and 7)

Key	28	71	43	11	56	17	63
Position	0	1	2	4	3	5	6
Number of probs	1	1	2	1	4	3	7

External Rehashing

```
0 │ → 28 → 56 → 63 → 7
1 │ → 71 → 43
2 │
3 │ → 17
4 │ → 11
5 │
6 │ → 6
```

Key	28	71	43	11	56	17	63	6	7
Key position in the list (from 1)	1	1	2	1	2	1	3	1	4
Index of the list	0	1	1	4	0	3	0	6	0

Coalesced chaining

```
0    28
1    71
2   epla
3    17
4    11
5     7
6     6
7    63
8    56
9    43
```
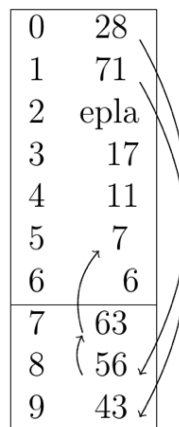
Key	28	71	43	11	56	17	63	6	7
Position	0	1	9	4	8	3	7	6	5
Index of next element	8	9	-1	-1	7	-1	5	-1	-1

Problem 2

$H(1234) = (43 + 21 + 3) \% 11 = 67 \% 11 = 1$

$H(519) = (91 + 15 + 1) \% 11 = 107 \% 11 = 8$

$H(911) = (11 + 19 + 1) \% 11 = 31 \% 11 = 9$

$H(7346) = (64 + 37 + 4) \% 11 = 105 \% 11 = 6$

$H(0) = (0 + 0 + 0) \% 11 = 0 \% 11 = 0$

$H(999) = (99 + 99 + 9) \% 11 = 207 \% 11 = 9$

$H(99834) = (43 + 99 + 8) \% 11 = 150 \% 11 = 7$

$H(54) = (45 + 45 + 4) \% 11 = 94 \% 11 = 6$

$H(40015) = (51 + 04 + 0) \% 11 = 55 \% 11 = 0$

0	0	1
1	1234	1
2	54	8
3	40015	4
4	empty	0
5	empty	0
6	7346	1
7	99834	1
8	519	1
9	911	1
10	999	2

Number of probes to search for 11 is 4.

Problem 3

```java
public static int charHash(char[] k) {
    int hash = 0;
    for (char c : k) hash += c;
    return hash % 1000;
}
```