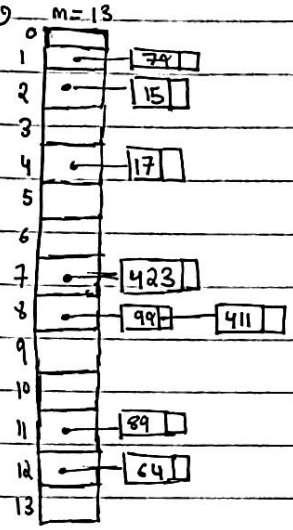
2) Given a sequence of inputs, 17, 423, 64, 79, 411, 89, 99, 15

$h'(x) = x \bmod 13$.

(a) Chaining m = 13



17 mod 13 = 4

423 mod 13 = 7

64 mod 13 = 12

79 mod 13 = 1

411 mod 13 = 8

89 mod 13 = 11

99 mod 13 = 8 ← collision

15 mod 13 = 2

used for both these parts as well

(b) linear probing hash function: ~~[illegible]~~ $h(k,i) = (h'(k) + i) \bmod m$

0	
1	79
2	15
3	
4	17
5	
6	
7	423
8	411
9	99
10	
11	89
12	64

$(99+0) \bmod 13 = 9$

↑ ← collision

(c) quadratic probing, hash function $h(k,i) = (h'(k) + c_1 i + c_2 i^2) \bmod m$

0	
1	79
2	15
3	
4	17
5	
6	
7	423
8	411
9	
10	99
11	89
12	64

99 collision

new position:

$(99 + 1^2 + 1) \bmod 13$

$= 10$

(d) double hashing $h_2(x) = 7 - (x \bmod 7)$

0	
1	79
2	15
3	
4	17
5	
6	99
7	423
8	411
9	
10	
11	89
12	64

$17 \bmod 13 = 4$

$423 \bmod 13 = 7$

$64 \bmod 13 = 12$

$79 \bmod 13 = 1$

$411 \bmod 13 = 8$

$89 \bmod 13 = 11$

$99 \bmod 13 = 8$

collision

$7 - (99 \bmod 7) = 7 - 6 = 1$

$15 \bmod 13 = 2$